

How UHF Will Affect Your TV

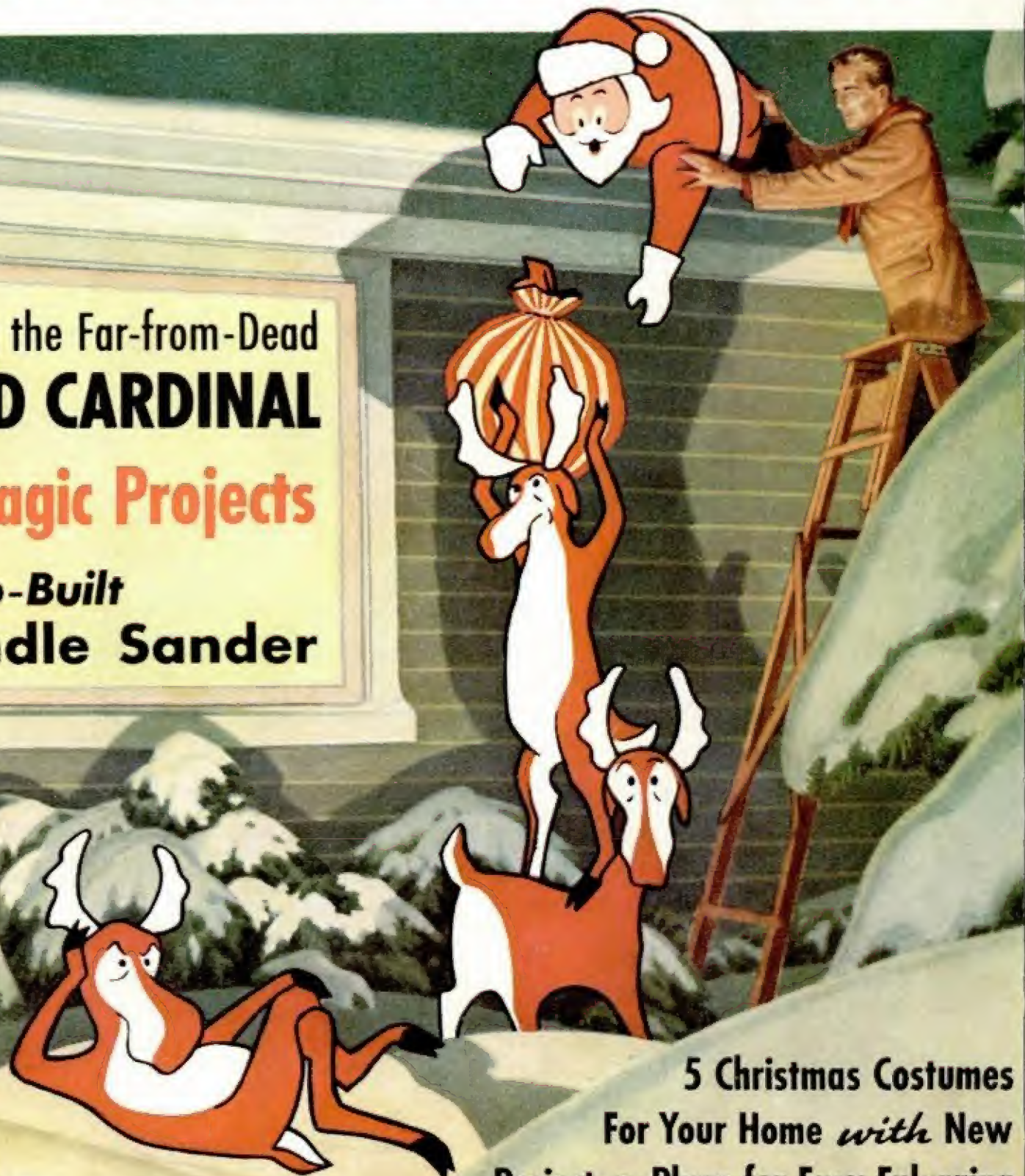
POPULAR MECHANICS

DEC. 1962
35 CENTS

Testing the Far-from-Dead
FORD CARDINAL

3 Magic Projects

**Scrap-Built
Spindle Sander**



5 Christmas Costumes
For Your Home *with* New
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**'63 BUICK
WILDCAT**

Anatomy of a Buick WILDCAT!

Engine: 90° V-8 valve in head. Displacement: 401 cu. in. Maximum h.p.: 325 @ 4400 rpm. Maximum torque: 445 ft.-lb. @ 2800 rpm. Compression: 10.25:1. Bore and stroke: 4.1875 x 3.64. Carburetor: one 4-bbl. down-draft. Valves: hydraulic lifter type. Rear Axle: hypoid semi-floating. Gear ratio: 3.42. Transmission: automatic, torque converter type. Brakes: 12" Duo-servo. Finned aluminum up front. Advanced Thrust: Re-positions engine forward. Gives straight tracking, flat cornering, easy handling.

Buick Motor Division—General Motors Corporation

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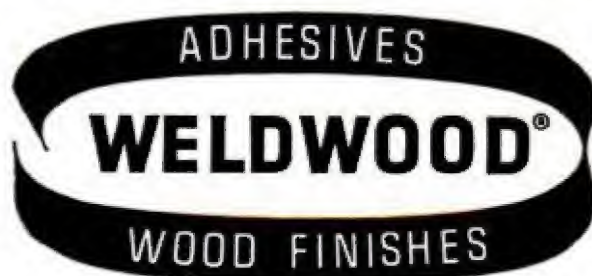


When a miter joint gapes slightly, don't despair. Complete the piece, apply the finish, and then fill the crevice with a Weldwood Putty Stik® of the right color—25 wood colors available.



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car if you'll only give it a little help.

How? Easy. Just drive "Old Faithful" down to see the guy who sells Autolite parts. He's got a whole shelf full of nifty items that will make any moocher a miser in the miles-per-gallon marathon.


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DECEMBER 1962

VOL. 118

NO. 6

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Next Month . . .

THE WILD ONES—Sting Ray, Avanti, Riviera, T-Bird—are test matched at Lime Rock by John Fitch, former Mercedes team driver; PM raises the curtain on the startling new look in brass trim; Alexis Sakhnoffsky turns his dream car sketch pen to the sleekest features on the '63s; a Detroit engineer takes you behind the scenes for a look at this year's major breakthroughs and how they were wrought. Also, Sir Edmund Hillary reveals "what's left to explore."

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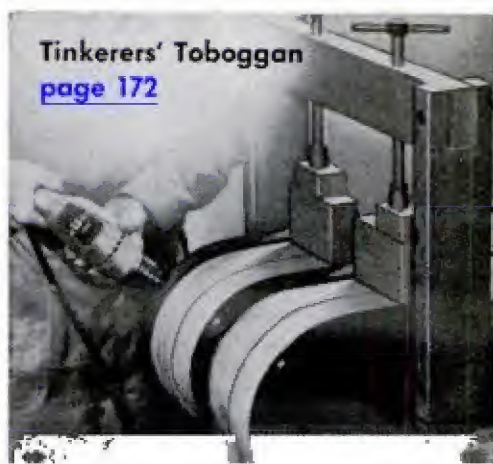
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"My salary has increased 400 % as a direct result of my LaSalle studies." —Rudolph Urbatis, Port Chester, N. Y.



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325

Over the editor's desk

A Vote for the Deep V

I am most grateful for your article on "Two New Hulls Meet Two Old Problems" (Sept. PM). It changed my whole conception of small-craft design.

I'm planning to buy a 20- or 22-foot fiberglass cruiser which will be used for off-shore fishing on the South Jersey Coast. I need a boat designed for rough water, and I was almost sold on a catamaran. However, after reading the above-mentioned article, I firmly believe that the Hunt-designed Deep V is the boat for me.

Churchville, Pa.

C. H. MARTIN

Thanks for the kind words, reader Martin. However, before buying any boat, we advise you to take out a number of different designs for test runs. This can't do any harm, and even if it only confirms your choice of the Deep V, you'll enjoy some pleasant boat rides.

Good Coverage

About two years ago the farm manager complained that the manure spreader mired down when the fields were wet, and the front cover (Sept. '60 PM) furnished an idea. The enclosed picture is the result.

The frame is white oak. Power is a 1947 Ford six-cylinder engine . . . the drive shaft from the engine drives the rear set of wheels and also a jack shaft which drives



the other three sets of wheels. The hand brake locks the side toward which a turn is to be made. The body is on a hydraulic dump bed which is raised to slide the load to the rear where it is ejected.

Louisville, Ky.

FRANK B. THOMPSON

We've always bragged about the way PM gets around, but this adaptation is in a class by itself when it comes to getting coverage.

Well-Coached Team

Thought you might like to see a picture of the stage coach I built from your plans (p. 166, March PM). We thoroughly enjoyed building this project and, needless to



say, the neighborhood children enjoyed the finished product.

Malibu, Calif.

H. IRVING KERR

Yes, we do like to hear about projects that turn out so happily; even that "team" appears enthusiastic about it.

Delicate Rolls-Royce

In your March issue you ran an article about the Rolls Royce over which my uncle and I got into an argument. He said a Rolls would never stand up under 'teen-age driving. What is your opinion?

Bainbridge Is., Wash.

E. CHRIS WILLIAMSON

Any 'teen-ager with a sane attitude about driving, who is willing to learn from pros rather than experiment wildly, would probably do an excellent job in a Rolls Royce. But no car can stand up under the calculated abuse of a driver ('teen-age or otherwise) who tries to turn public highways into the Daytona 500.

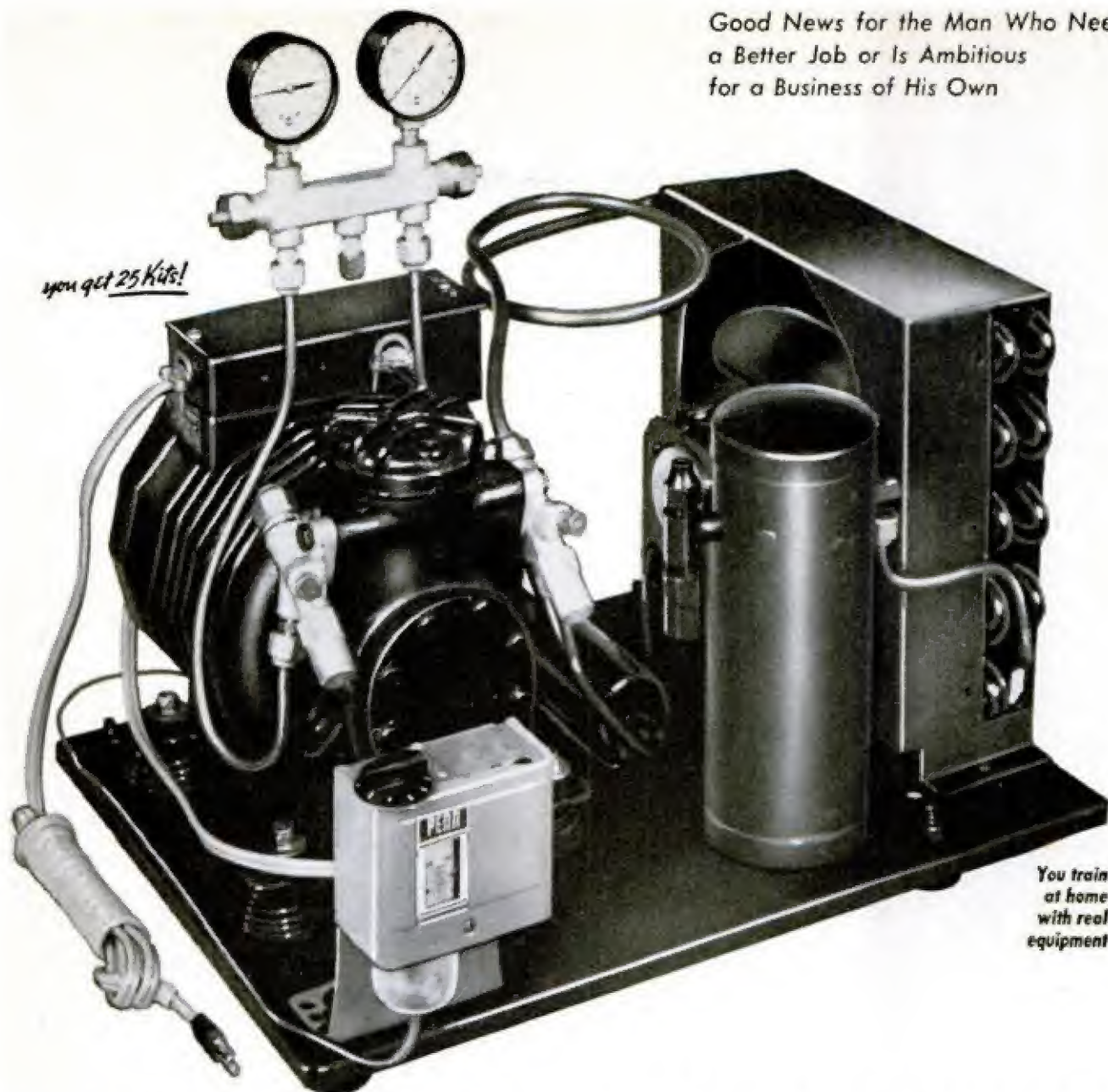
Can Inventors Succeed, Even Trying?

I greatly appreciated the sound common sense of Eugene Raudsepp's article, *Develop Your Inventing Ability* (p. 100, June PM). Unfortunately, I cannot envisage any reliable means for a nonwealthy individual to protect his ideas.

The dice are, surely, loaded against in-

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a Better Job or Is Ambitious
for a Business of His Own



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For the reasons why, turn page

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GOODYEAR

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dividual inventors, and the current craze for invention amongst amateurs is as much of an amusing waste of time as crossword puzzles.

Salisbury, South Rhodesia A. J. G. EVANS

Judging from our mail, U.S. inventors seem to be able to get patents on their ideas without too much trouble (other than the long wait to have patents processed). The big problem seems to be that of finding someplace to market the ideas.

Gooneys Are Still Ahead

I am surprised that the Navy couldn't think of a simple way to get rid of those birds ("The Gooney Birds Are Winning the Second Battle of Midway," p. 102, Sept. PM). Tell them to get rid of the eggs as fast as they can. With no eggs to hatch, the birds would die off. They could put in china eggs to keep them from laying more.

Brockton, Mass. R. L. JOHNSON

The Navy has already tried that, reports PM staffer Kevin Brown, who wrote the article. The sailors found that it would take the biggest egg-collecting job in history to do it effectively. The problem is that gooney birds nest and hatch eggs all up

and down a 1200-mile chain of islands, so all the eggs on all the islands would have to be collected at one time to stop the gooney birds.

Rare Bird

I am aware of the great choice of body styles which Detroit offers today, but isn't the 1963 Valiant half two-door hardtop, half four-door sedan (pp. 88-89, October PM) a bit ridiculous? What is the purpose of the split personality of the Valiant as it was shown?

Kimberley, B.C.

MAURICE FREER

Sharp-eyed reader Freer has spotted one of Detroit's rarest of birds, the untamed three-door prototype. Such cars are hand-built long before production lines start up to provide photographers something to snap and editors something to drive and evaluate. Since hand-built prototypes cost upwards of \$50,000, thrifty Valiant gets a two-door hardtop (left side) and a four-door sedan (right side) for half the \$100,000 that complete models of both would cost. Cars like this are not for sale.

The Editors

LOOKING FOR LONG WEAR IN OUTDOOR BOOTS?

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RANGER No. 1154-1 by
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Ask for Neoprene soles the next time you buy outdoor boots!

Better Things for Better Living... through Chemistry

Satellites to Map Earth

Space satellites carrying scientifically advanced cameras will map Earth with unprecedented precision early in 1963. A new method of triangulation, based on optical tracking of Echo-type satellites from three or more mobile camera stations, will be used. The satellites, inflated in space, will be tracked against stars whose positions are known. The camera shutters can be timed with an accuracy of 1/1000 second.

The first mapping project of the U.S. Coast and Geodetic Survey's program will be to measure the distance across the U.S. with less than a 33 foot error. The positions of Hawaii, Alaska and the Aleutian Islands will then be located, followed by other areas.

Other objectives of the system are the development of Earth-satellite navigation and the positioning of oceanographic ships where other aids are not available.

May Detect Porpoise "Talk"

Sound dissection is shedding light on what causes metals to wear out and break—and also promises to help man talk to porpoises.

Frank R. Stevens of the Spectran Corp., whose organization makes \$15,000 sound analyzers which break wavelengths into 480 parts for display on cathode ray oscilloscopes, says:

"Metals are known to 'scream' when torn apart; analysis of these screams will further the understanding of fatigue and rupture. Indeed, there is hope that specialized versions of these analyzers will help predict ruptures."

The analyzers have not yet been used on porpoise sounds but they have been used on human speech. "From what has been learned," says Stevens, "we believe that if man ever does talk to porpoises, this analyzer will have helped him to do it."

Take a close look at the flakes

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Notice the different cuts and *colors* in the flakes? Each one adds its own personality, and when they're all together, a secret recipe does something rare for the flavor. Try it soon and get some new pleasure in your pipe.



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Virginia Bright—bright leaves, even burning
Old Belt Bright—slightly darker, good body
Latakia—deeper brown, extra mild
Perique—very dark, wonderful aroma

REVELATION

MILD SMOKING MIXTURE





Does a chicken know when she lays an egg? Probably not, says a Scottish scientist. He claims that a hen's biological clock tells her when to lay an egg—and that she probably doesn't even feel it. He operated on several hens so that they laid their eggs before the shells were formed—and without going to a nest. But at the time the shells normally would have been formed and the egg ready to emerge, the hens went through the routine of going to their nests and cackling, even though they didn't lay anything.

What's the moon like? Do the experts know? It's porous and grainy like sand, said one astronomer at a recent Lunar Exploration Conference at Virginia Polytechnic. Another said it was deep in dust; still another theorized that the surface was hardened lava. We won't know the answer, said Nobel scientist Dr. Harold C. Urey, until men actually land on the moon.

Silent substitute for a pneumatic drill? A firm in England is using a "drill" which emits radio microwaves to split rocks with concentrated heat. In tests, the machine cracked a concrete slab five feet square and nine inches thick.

A German professor believes he has dug from the clay banks of the Elbe River the world's oldest known art objects. At a depth of about 40 feet, he found pieces of rock showing crudely outlined faces—both animal and human—and says they date from the Ice Age, more than 100,000 years ago. Until now, the earliest known art work by man was believed done in the Aurignacian period, 30,000 to 40,000 years ago.

A method of "tuning" laser beams, recently announced by General Telephone & Electronic Labs, may provide the means for linking space craft in orbit. The beams are controlled by directing light through two electro-optic crystals while a modulating voltage is applied from a generator.

Even the canines are counting calories in England. A British firm is marketing a prepared reducing diet for overweight dogs. Available only through veterinarians, it comes complete with a chart so a fat dog's reducing program can be checked.

The subzero temperatures associated with superconductors may provide astronauts with protection from the deadly charged particles of the upper atmosphere. The magnetic field generated in a superconductor shield would, according to Dr. Richard L. Garwin of Columbia University, bounce the particles back into space.

Synthetic detergents, which often foam up in springs and brooks because of their tendency to accumulate in water supplies, may now be removed through improved ways of applying activated carbon to waste water, followed by treatment with an alum solution and filtration, according to the American Chemical Society. The special form of carbon used is made from either coal, peat or wood; it can be re-used by burning off accumulated material.

Whether or not Noah's Ark is encased in a glacier on Mount Ararat in Eastern Turkey may be known for certain within three years. A team of international archaeologists, the first scientific group to systematically search for the vessel, recently found several pieces of wood which they believe to have been part of the giant boat. During the next annual thaw of the glacier, the group plans to use an ice camera and infrared rays to take photographs of the glacier's interior.

An underground sea, said to be as big as the Sea of Azov, has been located by Ukrainian geologists near the Dnieper River. The sea, more than 300 feet deep in places, is being studied to see if the water can be used for irrigation.

They're using toothbrushes and butter-knives to look for the bones of the Viking explorer, Leif Ericson, near a fjord in Greenland. Scientists from the Danish National Museum are digging with these unlikely instruments in an ancient Viking cemetery to keep skeletal remains as intact as possible. After more than nine centuries in the moist soil, little is left of the scores of Vikings buried there. The only hope for identifying Leif is the chance that he might have been buried in armor or with some distinctive emblem in metal or stone. So far, 10 skeletons have been unearthed.

(Continued on page 22)

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Science Worldwide

(Continued from page 20)

A new type of tire to combat skidding on snow and ice has been developed in England. It has a special chopped steel wire strand milled into the tread compound and bonded into place. The surface looks like suede and is rough like a wire brush.

Scientists in Czechoslovakia want to make the moon more habitable by giving it a 24-hour day just like the earth's. A scientific report says the moon could be made to rotate on its own axis once every 24 hours by setting off nuclear explosions in deep holes around its equator at proper angles to the horizon. The blasts, the Czechs say, would set the moon spinning and let the sun heat its surface more uniformly.

Why do some winged insects spend more time flying than others? It's because of an enzyme called alphaslycerol phosphate dehydrogenase, say two nimble-tongued New Zealand scientists. This enzyme is located in the muscles of insects, they say, and without it, even with bugs that have wings, they seldom take to the air. The researchers found that insects like the bumblebee, which flies a lot, were loaded with

the substance. Other insects, like the praying mantis and the katydid, which do very little flying, had the material in their muscles but in much smaller amounts.

A relatively inexpensive periscope is now giving British technicians a direct illuminated view into normally inaccessible parts of machinery. The "introperiscope" is three feet long and has a viewing angle of nearly 100 degrees. The angled end, consisting of a lens and an electric light bulb, can be inserted through any opening that's at least two inches in diameter.

A recently announced technique for making diamonds directly from graphite may not make General Electric "a girl's best friend" but it should make industrial users happy. The method involves a combination of extremely high temperatures (9000 degrees F) and pressures (up to 3 million pounds per square inch). The new method eliminates a catalyst previously needed.

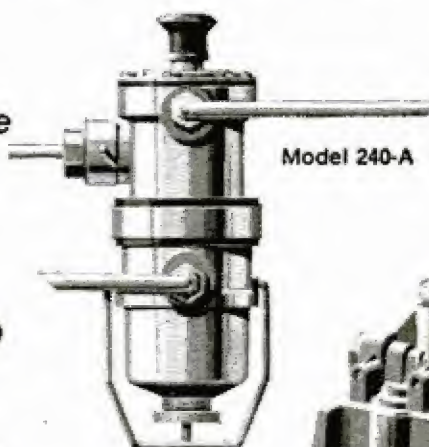
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Items from all outdoors

Star of the world shooting matches at Cairo was Cpl. Gary Anderson, who won four of the U.S.'s five gold medals. (See story on p. 114.) Although the Russian team won the meet, the U.S. pressed them all the way for a close second. Anderson, a member of the Army's Marksmanship Training Unit, set three world records, scoring 395 in the 300-meter free rifle prone position and 1138 in the aggregate. He won the standing 50-meter small bore with a 376 and set a world record for the aggregate with 1157. The USA's only other gold medal was won by the skeet team. West Germany placed third in the meet and Switzerland was fourth.

✓ ✓ ✓
A glass-barreled gun lured us out for a day of trap and skeet shooting at the Winchester Gun Club, in New Haven, Conn., and we can report that the new Winchester 59 shotgun is a beauty. Although partial to the pump gun, we have to admit that the automatic action on the 59 helps to get that second bird on the skeet course. It has more kick than other models we tried, but the glass barrel cuts the weight down to 6½ pounds, making it an ideal gun for the field, where you have to carry it for five or six hours.

✓ ✓ ✓
Still have some of last season's deer in the freezer? Here's a recipe from Mrs. Agnes Laska of St. Paul, Minn., that will add a deliciously different touch. *Venison chops in beer gravy*: Brown thick venison chops in bacon fat in a large skillet. When chops are nearly browned, add two sliced onions and continue browning the chops. Slice in a garlic clove, add half a small can of tomato paste and a cup of beer. Cover and simmer for half an hour until tender. Use beer again to make the gravy. Salt and pepper to taste.

✓ ✓ ✓
Game counts are important to regulate each season's bag limits, but they are difficult to administer. Many states have found a good system. They ask the rural mail carrier. He travels the same route every day and can keep tabs on general game-population trends. South Dakota has 700 mail carriers keeping tally on everything from deer to grouse and pheasants.

Stuart James

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The Model AT-162 includes the very latest design Dwell Meter, working in conjunction with a dual range Tachometer and incorporating all modern improvements in circuitry design.

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The Model AT-162 will perform the services specified below in addition to many other tasks too numerous to mention:

- Assure precise adjustments of points that are slightly worn or pitted.
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The Model AT-162 provides three dwell angle scales; 0 to 45 degrees, 0 to 60 degrees, and 0 to 90 degrees. The three dwell angle ranges specified above make this instrument suitable for making accurate dwell angle adjustments on all 4 cylinder, 6 cylinder, and 8 cylinder cars, both foreign and domestic.

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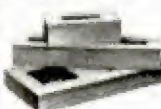
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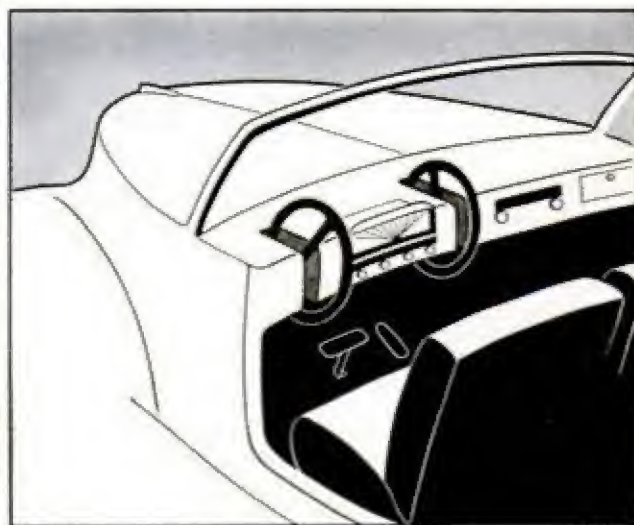
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Tune in on the inventors

by J. L. Pugni

Are two steering wheels better than one? Inventor Matthew Vacante, Syosset, N. Y., whose patent is pending, thinks so. Here's how it works: The wheels are interconnected to rotate in opposite directions. If the driver wants to make a right hand turn, he rotates the right hand wheel so its top



edge moves forward. At the same time, the wheel at the driver's left hand is rotated with its bottom edge moving forward. The dual wheel is supposed to remove the hazard of a steering column in case of an accident and afford the driver an unobstructed view of the road and the instrument panel.

* * *

Youngest inventors in the country are thought to be Paul and Nanette Gomory, Washington, D. C. They invented a storm window four years ago when they were 10 and 15 years old. The window is made by first removing the screen from the frame and wrapping thin sheets of plastic tightly around it. The plastic covered screen is then re-inserted in the frame. It won patent 3,057,401.

* * *

Bank robbers will be surprised when George S. Harner's new detector is marketed. When a teller hands over a package of money with the detector concealed inside, he presses a button on the side of the package. Minutes later, when the thief is making his getaway, a stop watch sets off an explosion of dye which splashes over the money, the robber and perhaps his car. Patent 3,053,416 was granted on this idea.

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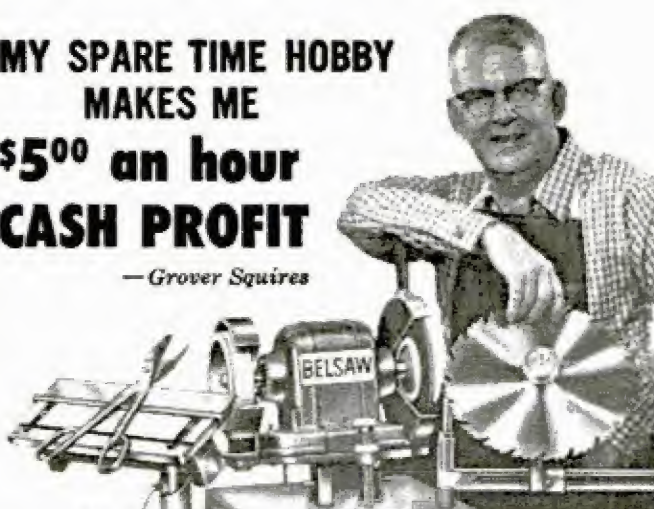
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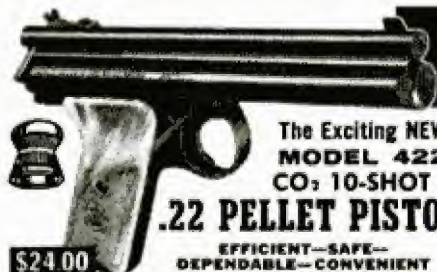


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Sidelights on aviation

Military parachutes, declared surplus, are being offered for sale to the public—specifically, to sky divers.

The Parachute Club of America, in fact, was instrumental in persuading the Department of Defense to relax its rules on disposing of phased-out chutes.

Surplus parachutes are now offered at auction after they have been inspected and found airworthy.

The Federal Aviation Agency has 15 parachute lofts throughout the country where these inspections and auctions are held.



Community airports, trailblazers in new subdivisions, apparently are sowing seeds of their own destruction.

They are built in undeveloped areas on the outskirts of town. Roadways and utility services are put in to accommodate the port, then other developers follow to take advantage of the new facilities. Shopping centers, homes, service stations and drive-ins, even factories grow up around it. First they squeeze off any future growth, then increase the real-estate values of the area and finally raise taxes to the point that the airport is priced out of business.



Speaking of parachuting, as we were a moment ago, the speed at which paratroopers can be dropped have been increased and lowered, respectively.

In World War II, troops were dropped at about 115 m.p.h. from 1000 feet. The exits, however, were widely spaced. New studies show that a fully equipped soldier, with a total dead weight of 300 pounds, can be dropped from as low as 300 feet at up to 450 m.p.h. And a new system is used to get the men out faster. The closer together they exit from the troop carrier, the closer together they will land on the ground. This is essential for fast regrouping.

The system consists of a continuous moving cable with hand stirrups, similar to those on buses and subway cars. Each paratrooper grabs one, moves along with it and jumps when he reaches the door. The present system allows the paratrooper to set his own pace going out the door.

Kevin V. Brown

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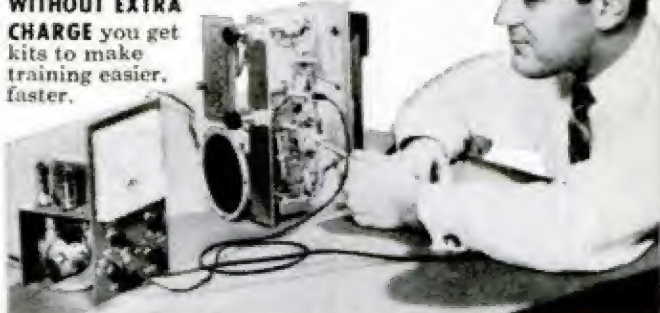
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Atomic wastes may be used to help furnish food for the rapidly disappearing supply of fish in the ocean's depths. According to members of the Food & Agriculture Organization, nutritive matter and oxygen are trapped on the ocean's floor under layers of stagnant water, silt and mud.

FAO experts have suggested that sealed containers of atomic wastes be dropped in the water where they would generate heat and warm the surrounding water. When the water warmed sufficiently, it would rise and suck up silt containing food and oxygen toward the surface within easy reach of the fish.

Huge Waves Stir Sun's Surface

Huge 40 to 50-mile high atmospheric waves rising and falling at the rate of 1000 miles per hour constantly agitate the sun's surface. Dr. Robert B. Leighton, California Institute of Technology, discovered and photographed the waves through the 65-foot solar telescope at Mt. Wilson Observatory with a "Doppler-effect" camera.

This technique translates movements of solar matter toward and away from the observer into black, white and gray on film. Further studies of the waves will reveal the general nature and detailed properties of motions in the solar atmosphere.



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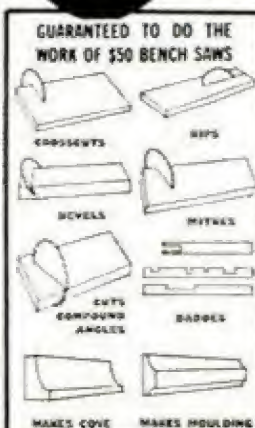
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Pentagon sidelights

By William R. Kreh

Instant barbed wire is being tested now by the Marines. It consists of a hand-held wire gun which can play out a couple of hundred feet of barbed wire in seconds. Weighing only 11 pounds, the gun is intended for use in helping to stop riots or to set up quick barricades.

Mounting spider webs is the novel form of art practiced by a soldier at Fort Ord, Calif. When Pvt. James Shipley finds an intricate web spread among bushes or trees, he sprays it with white paint, then transfers it to a sheet of heavy black paper and then preserves it with a spraying of clear shellac.

Speech predicts cancer. Air Force scientists involved in a speech research program leading to development of new communications systems have found that cancer in the larynx can be detected at an early stage by analyzing speech signals of individuals.

Those cars "bugged" him! Failing to get the "bugs" out of the Pentagon, Defense Secretary Robert McNamara is now recognizing they exist and is putting them in their place. He has established a special parking area for "bugs"—small cars—in the Pentagon's vast parking lot. One whole lane is now reserved for the bugs, just as long as they're not more than 168 inches long or 61 inches wide. Pentagon traffic cops now carry tape measures with their night sticks and guns as regular equipment.

A chapel of solid ice in the middle of a Greenland glacier has been built by the Army. Located at the Army's Camp Tuto, the chapel is 12 feet high and 10 feet wide, and has a 700-pound altar formed from a single block of ice. Even the candlesticks are of pure crystalline ice, hand rubbed until they are as clear as fine glass.

Making money vanish is no trick for a wife on a shopping spree. But even she can't get rid of money as fast as the Army can. Chemical officers at Edgewood, Md., recently destroyed a ton of cash trying to find a new way of destroying money rapidly to keep an enemy from using it in the

event of attack. The money, about \$7 million worth, came from the Treasury Department and was in the form of worn-out and imperfectly printed bills that were going to be destroyed anyway. Details of the destruction process are classified, but an Army spokesman said it involves a chemical that disintegrates the money.

A new white flight suit, made of a fabric called HT-1, is being tested by the Navy. It has about the same properties as nylon at room temperature, yet will not melt. The fabric chars slowly at around 750 degrees.

The old 16-inch gun used by Navy battleships in World War II is again coming into its own. The "obsolete" guns won't be hurling customary 2000-lb. high explosive shells at enemy targets, though. Instead, they'll be loaded with scientific ammunition packed with instruments. The firings will take place in the British West Indies where specially designed scientific projectiles are expected to be fired from the guns to heights of 900,000 feet.

Skinny-screen television is here. Army missile engineers have developed a tiny TV camera only three inches wide to track space objects automatically. The midget transistorized camera, weighing only seven pounds, is part of a system to predict the impact of space vehicles.

Ships without wheels—that's what the Coast Guard is planning to build. Next new ship for the service will be a 157-foot coastal buoy tender that will be steered by a lever that looks like an old-fashioned tiller. Reason: it's easier for a helmsman leaning out the pilot house window to maneuver close to a buoy with a lever.

Pre-shrinking computers are next. In case you want to know how much your socks shrink in the laundry, an Army civilian employee at Fort Lee, Va., has invented a machine that will do it. The device accurately measures the shrinkage, after washing, of garments including hats, gloves, shirts and stockings. The Army will use it to make sure manufacturers of GI clothing live up to standards.

Ten-thousand-point landing. An Air Force sergeant at an air base in France recently guided 5000 pigeons to a perfect landing on the runway in a dense fog. The birds were inside a C-47 transport plane. They were flown in to be released by the Danish Society of Pigeon Trainers for a race from France to Denmark. ★ ★ ★



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Each station, to be tended by an on-the-scene assistant, will have a four-windowed shelter to house cameras aimed in the four directions. Each camera will operate automatically from sunset to sunrise, taking pictures of the sky.

Stars as faint as magnitude eight will register, but fast-moving meteors must be of zero magnitude (brighter than the Big Dipper stars) to be recorded. Meteors brighter than the planet Venus will be analyzed for the possibility that they may have fallen to Earth and be recoverable.

Freshly fallen meteorites are invaluable to scientists, since they are the only solid material reaching Earth from interplanetary space. They are important for determining their ages from their radioactivity and as a possible clue to life beyond Earth.

Museum specimens usually are contaminated from having been on the Earth's surface for some time, hence the need for the network.

Stations will be at: Havana, Ill.; Milan and Vienna, Mo.; Vinton and Maple River, Iowa; Liberty, Alma, Neligh and Mullen, Neb.; Farlinville, Goessel and Kalvesta, Kans.; Ward and Lower Brule, S.D.; and Cederdale and Hominy, Okla.



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Arms and armor authority, Harold Peterson, has just authored a well-documented book, "The Treasury of the Gun," which traces the story of important guns from the discovery of gunpowder to the late nineteenth century. Four-color portraits of matchlocks, wheel locks, flintlocks, breechloaders, repeaters and magazine arms in historical settings bring the text into focus. Its 252 pages also hold prints and drawings from museums and collections here and abroad. Published by Golden Press, 630 Fifth Avenue, Rockefeller Center, New York 20, N.Y., this worthwhile library addition is

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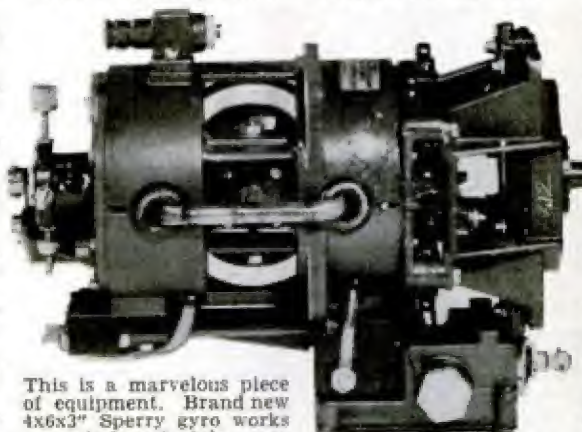
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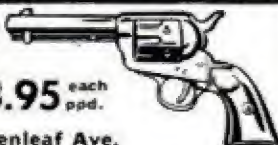
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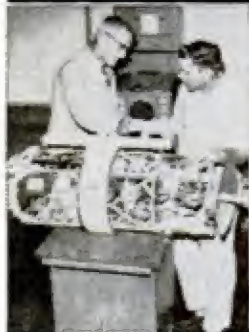
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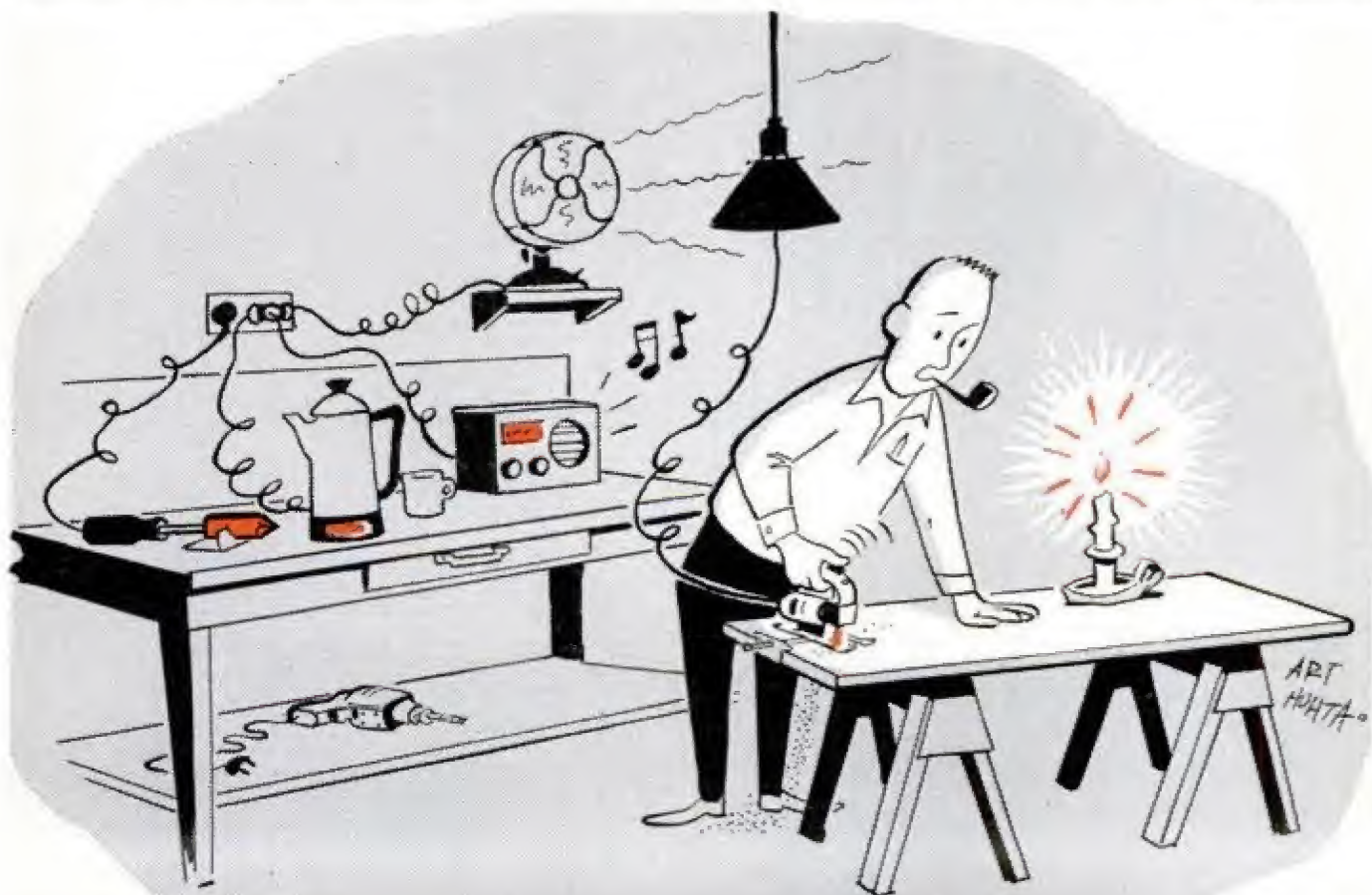
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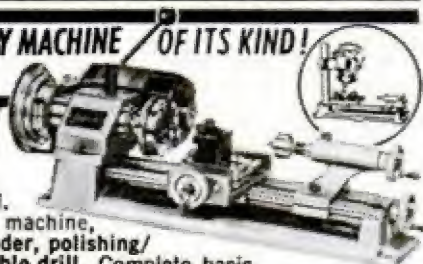
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Sunglasses with eye-shaped slits in them enable the wearer to view objects directly while his eyes are protected from reflected glare by tinted lenses. Made by Magnus Oceanic Corp., Washington Valley Rd., Morristown, N. J., the price is \$4.95.

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—most of it clear profit!"

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By Jim Whipple



Why Detroit Hasn't Gone All Out for Aluminum Engines. Hot Research Project: "Glued" Auto Bodies

As the hoopla of new car announcement time dies down, we can begin to take stock of the 1963 model year. Sometimes the features that are not added to the new models make bigger and better stories than the new items that are shouted about.

Take for example, the aluminum engines. They're still around, but nobody's pushing 'em as they were two years ago when five cars, **Buick Special**, **Olds F-85**, **Tempest**, **Valiant**, **Lancer** and **Rambler**, first offered aluminum V8's or sixes.

All this activity looked like the forerunner of a landslide, but it wasn't. There were foundry problems with GM's sand-cast aluminum V8 (**Special**, **F-85**) which were solved by all-out effort. The biggest problem, however, was non-technical; people simply haven't cared whether or not their cars' engines were aluminum or cast iron as long as the particular engine delivered performance and economy.

This meant that the extra cost of aluminum engine blocks couldn't be passed on to car buyers. **Pontiac's Tempest** is a case in point. For two years, the aluminum V8 engine was optioned at \$216 dollars extra. It went on less than 2% of all **Tempests**.

Reason for the extra cost is twofold. Aluminum itself is a more expensive metal and it requires cast-iron liners or sleeves inside the cylinder bores. These liners provide needed wear resistance that aluminum lacks. However, cast aluminum can take the heat and scuffing dished out by the flying pistons if it is hardened by addition of alloys, or chrome plated.

But because the alloys must be added to the entire melt of aluminum used in the casting even though it is needed only for the lining of the cylinder bores, the costs here are prohibitively high.

Most engineers agree that if there were a low-cost method of toughening up the cylinder bores, the die-cast aluminum engine would be low enough in cost to compete with the iron engine. The great plusses of aluminum that the engineers are eager for are of course, the savings in weight, which can be passed on to the consumer in the form of better handling due to lighter front ends, as well as fuel economy, better per-

formance, and last but not least, production cost cuts resulting from die-casting.

A breakthrough in the coating of aluminum cylinder bores may come in the not-too-distant future through the use of ceramic compounds which have proven to have satisfactory heat and wear resistance. When this ceramic lining process becomes a practical reality, the aluminum engine could make a real showing.

Joining of body parts is another area where automakers are searching for a technical breakthrough. There have been rumors recently about use of adhesives instead of spot welds to join sheet metal stampings into completed bodies.

Potential advantages of adhesive-bonded bodies stagger the imagination—particularly the imaginations of Detroit's cost-conscious engineers. Instead of expensive welding guns using tremendous amounts of electric power, a quick application by roller of an adhesive would do the joining job.

Also, adhesives would permit fastening of stampings in "blind" areas not accessible to welding guns. Today, body parts must be designed with flanges or "hems" of exposed steel to permit the "stitching" by spot welding guns. Elimination of these "hems" will permit more compact, lighter and stronger bodies.

If you've ever worked with epoxy resins in fiberglass reinforced plastics, you'll have an idea of how strong a bond is possible. Greater strength would result as a continuous bonded seam offers much greater contact than the weld spots. Of particular interest to car owners are the advantages of adhesives as a better means of replacing damaged panels in the field.

However, there's a major problem holding up the "glued" auto body. Chrysler Corporation's Cyclebond Division has found that a proper bond requires so smooth a mating of surfaces that the clearance for adhesive be no greater than .0020 inch. When the layer of adhesive becomes thicker than .0020, Cyclebond has found, the bond fails. Accuracy of body stampings is at the moment not in the area of .0020 inch, so the search for a more tolerant adhesive continues.



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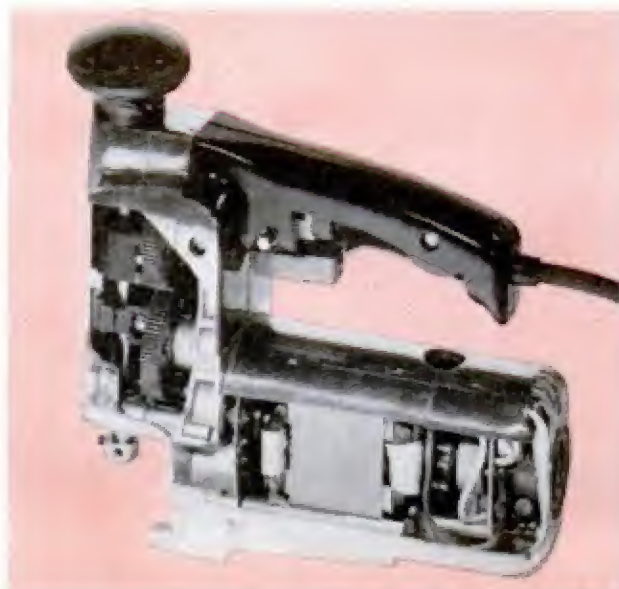


*the secret's
an SCR*

won't melt to clog the teeth. Low (1000 SPM) lets you tackle sheet steel, bar stock and low-temperature plastics. These have previously been hand-cutting chores, since high-speed blades burn upon steel, and fuse their cuts in plastic.

The seven-pound tool sells for \$49.95, with seven different blades, including a hollow-ground one for chip-free sawing of veneers and laminates, plus a circle-cutting and edge-guide attachment. There's an extra accessory that shifts the blade to the side of the base for flush-to-wall trimming.

The vibration-reducing gear drive is shown in the cutaway at right. The saw's not for DC; when an SCR is added to a universal motor, as here, the motor will operate on alternating current only.



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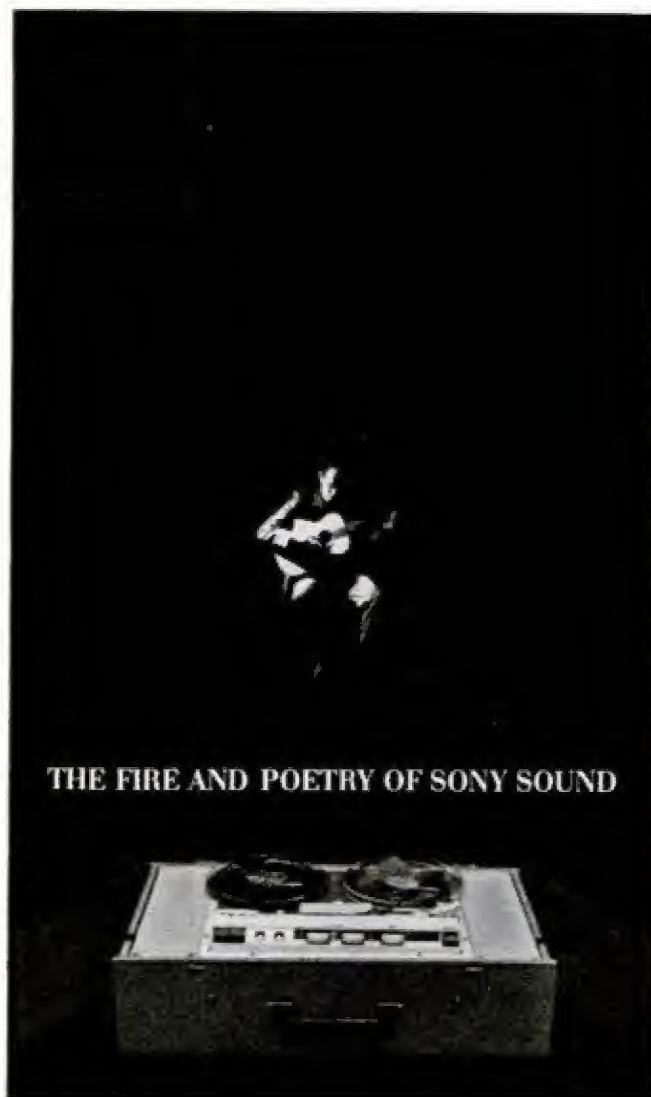
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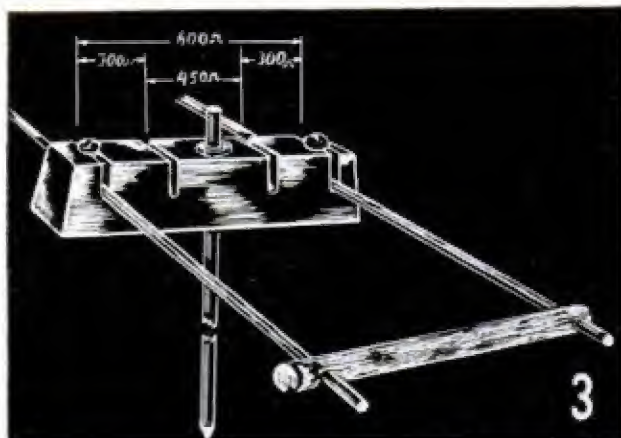
Another Sony triumph in tape recorder engineering, the new Sony 464 CS Stereorecorder *records and plays back stereo tapes* with the professional purity of studio recording. Whether it's the delicate tone of a Stradivarius, the fire and poetry of Flamenco, the resounding blare of seventy-six trombones, or the full magnificence of a London Symphony—all the richness of stereo sound—yours to command for only **\$299.50**. All Sony Stereorecorders are Multiplex Ready!

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On the market

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2. SCULPTURED CEILING of wood-fiber tiling offers custom beauty coupled with sound-muffling benefits. The textured tiles can be painted over in later years without spoiling the pattern or acoustical qualities. Available in several distinctive patterns, the tiles can be readily installed by using the manufacturer's Clip-Strips, nails and a hammer. Produced by National Gypsum Co., Buffalo 2, N. Y.

3. OPEN-LINE TRANSMISSION wire installations can be improved with Tappee Standoff Insulators. Holds #12 to #18-ga. wire for 300, 450 and 600-ohm installations. Setscrews permit free movement of wire in the slots, lessening danger of line breaks due to movement caused by wind. Block is polystyrene with hardware of double-dip steel. Available from Saxton Products, Inc., 4320 Park Ave., Bronx 57, New York

4. PLASTIC FORMS for casting Hacienda imitation quarried stone are now available in corner shapes, as well as multiple-size straight stones. No form coating is required, the masonry mixture is simply poured into the forms and left for 24 hours before removal. Rinsing the forms with water cleans them for the next job. Stone may be painted in colors. Forms, Inc., 554 West Adams Street, Chicago 6, Ill.

5. AUTOMATIC INTERIOR DOOR CLOSER is made of high-tenacity Nylon plastic in ivory or walnut coloring. Only six screws are required for installation and no oiling or other maintenance is necessary. Closing speed is adjustable and the door may be kept open by pushing a button that disconnects the two lever arms. Price is \$7.95 from Columbia International Corp., 10-35 44th Drive, Long Island City 1, N. Y.



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NEW 1963 FORD ECONOLINE VAN

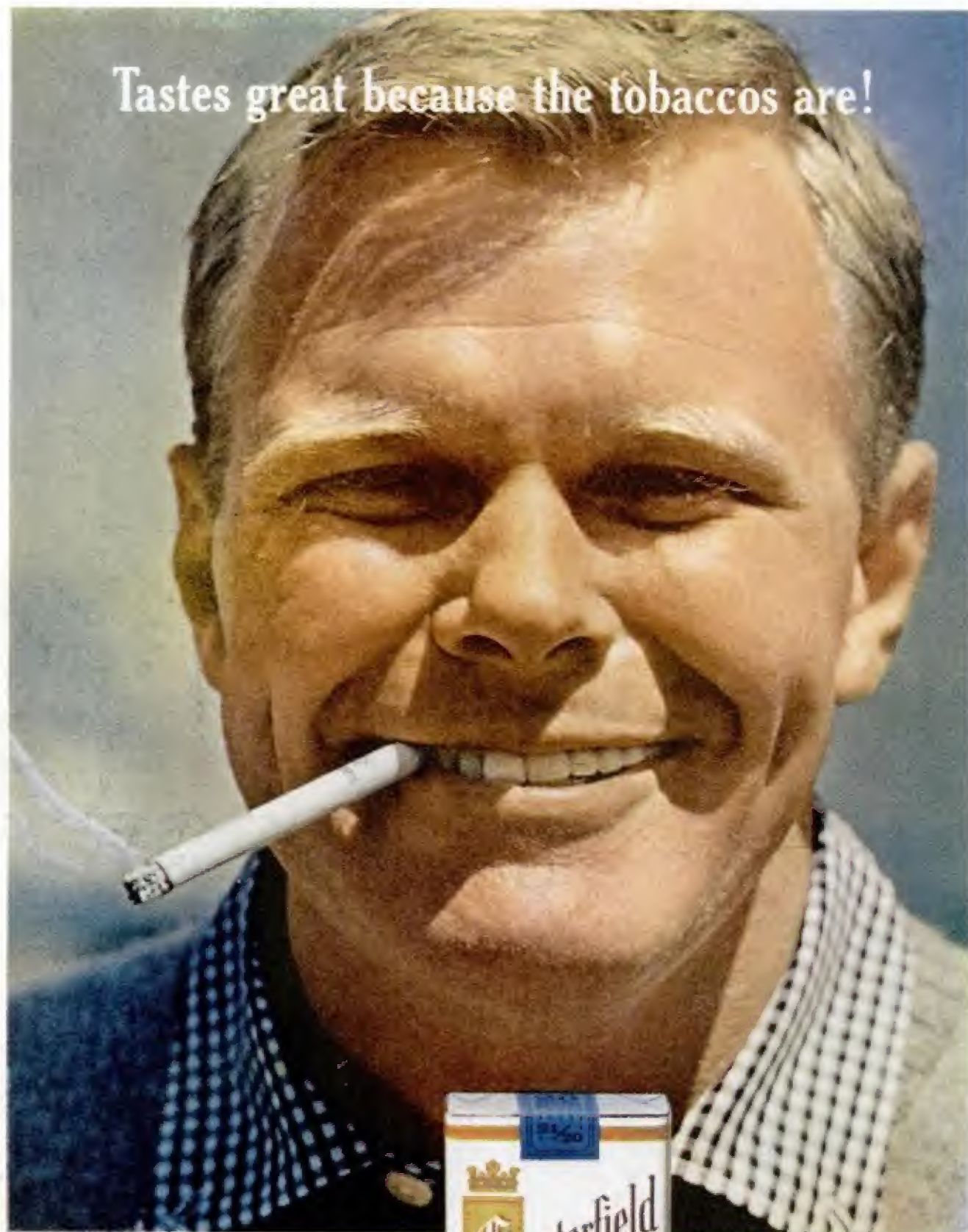
The more you look into Ford's Econoline Van the more you understand its popularity! Priced well below old-style panels, it gives you more capacity, loading ease, maneuverability . . . more

of everything you want. More economy, too. Savings can easily average \$100 a year. And for 1963 you get new reliability . . . a new transmission that's synchronized in *all* forward gears

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LOOK AT THE CRAZY THINGS THEY'RE DOING WITH...

GLASS

By Lloyd Stouffer

Remember when glass was considered the most delicate of materials? Those days are gone forever.

There is a sheet glass in production today so elastic that it can be bent to fit the curve of a drum and, when released, will snap back to its original shape.

There is a coil spring made of glass that depresses to one-third its length and springs back again.

There is a glass so

The ultra high strength of chemically treated sheet glass is demonstrated by bending it over a 20 inch radius and having it snap back to shape.





tough that it can be used to hammer a nail into an oak plank: a glass that resists heat of tremendous temperature, and a glass so porous that smoke can be blown through it, and it soaks up water like a sponge.

In use as a material for 3500 years, glass is only now coming into its own as one of the most exciting "new" materials.

The molecular make-up of glass is unique. Like many other materials, it is a liquid suspended in the solid state. But, unlike most, it is a solid that is not really a solid. The strange make-up affects the strength of glass, which theoretically should have strengths as high as three million pounds per square inch—much higher than the strongest steel. But the crystalline patterns of molecules that give strength to other solid matter do not appear naturally in glass, and only one percent of the potential strength could be realized.

Glass Freight Cars?

Now, however, through new techniques that change the fundamental nature of glass, six percent of the ultimate strength (180 thousand pounds per square inch) is being realized. Oscar Burch, technical director at Owens-Illinois Glass Co., predicts that his company will eventually produce a glass that is 10 percent of ultimate strength; a glass that will be used as a structural material in bridges, freight cars, airplanes and skyscrapers.

Through a process described as "nucleating," Corning Glass Works researchers were able to combine glass and ceramic to create a material known as Pyroceram. This de-

velopment solved a major problem for the National Aeronautic and Space Authority when they were searching for a guided-missile cone that would withstand the intense heat and buffeting of supersonic speeds through the earth's atmosphere.

Harder than carbon steel and lighter than aluminum, Pyroceram glass-ceramic looks like fine white porcelain. It is now available in hardware and department stores in the form of pots, pans and casseroles. It is named Corning Ware. It can stand empty all day on an open burner without harm, and it costs less than good stainless steel.

Thomas Edison would be astounded at what has been happening to his light bulb. At Corning's Hall of Science in Corning, N.Y., demonstrators mystify visitors with a light bulb that burns brightly when touched to what looks like a pane of ordinary glass. The secret: a thin, transparent coating of a metallic oxide that carries current from a wire at the edge. When a coat of special phosphor is added, and electricity applied, the frosty-white panels glow with a soft, cool light. This is known as electroluminescent glass, and unlike any other light source, there are no filaments, tubes or vapors, and practically no heat.

With electroluminescent glass it may soon be possible to produce a television picture—even in color—on a perfectly flat pane that you can hang on your wall. Already manufacturers are producing glowing glass table tops and walls that light.

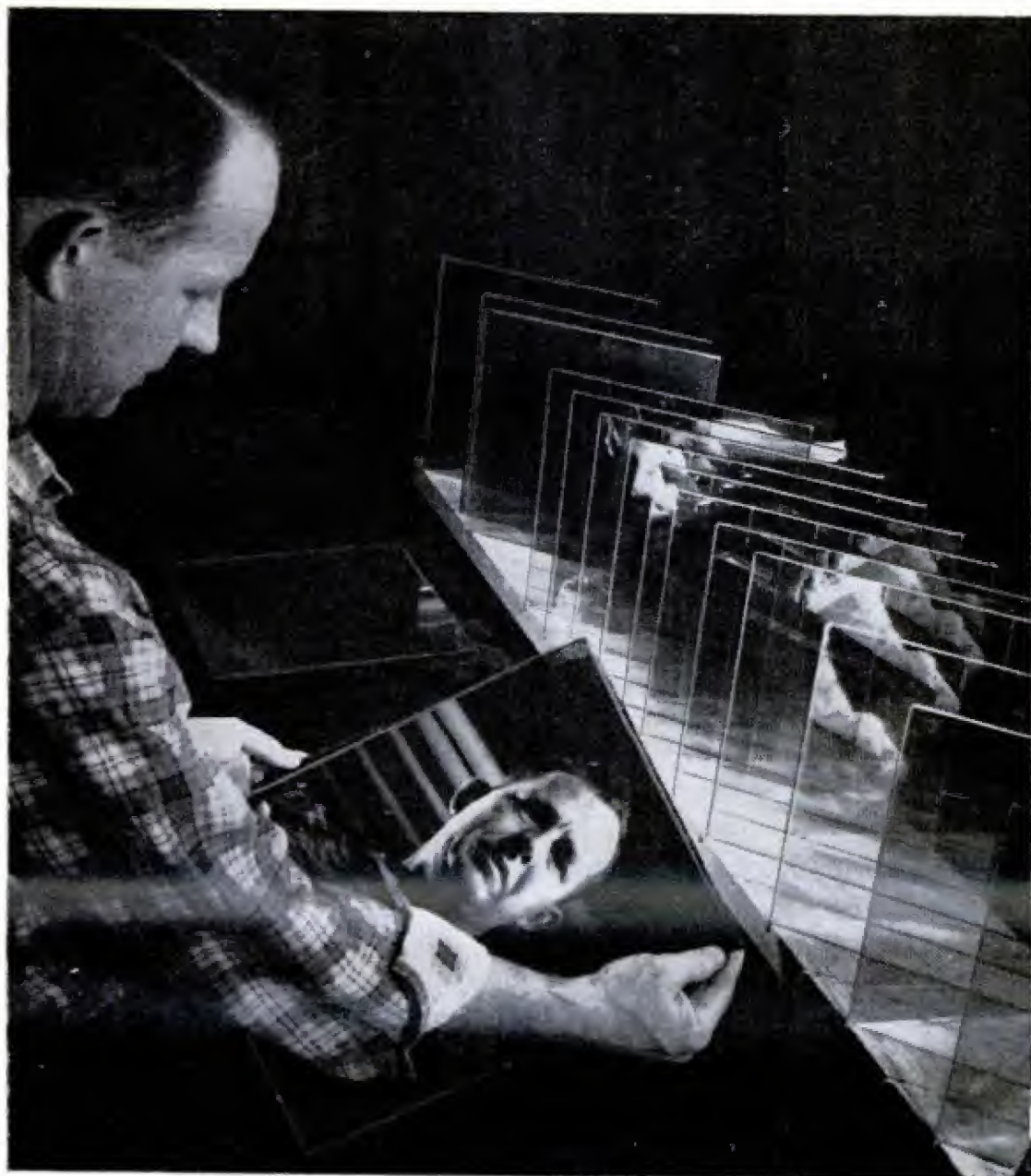
A surprising property of glass is its elasticity. A rubber band, for instance, loses elasticity each time it is stretched, while

← **BUNDLES** of loose fiber-optical glass (far left) are woven into flexible tubes. When light is applied, light rays follow the tube's curves, making it possible to see around corners

← **USING OPTICS ROPE**, glasses (left) superimpose scenes on trichroic-coated lenses, will allow a pilot to read instruments and keep watch on where he's going at the same time

ELASTICITY and strength of glass is dramatically demonstrated by U.S. Marine John Uelses (right) as he vaults to a new world record using a fiber glass vaulting pole →

SCIENTISTS created a photo-sensitive glass (below) that reproduces a photo simply by placing the negative over the treated plate glass and then exposing it to the light





GLASS DRAINPIPE is not only rust resistant, it is extremely tough. In Corning, N.Y. this strength is demonstrated by using a length of glass pipe to hammer a ten-penny nail into wood block



GUN BARREL of glass was first introduced in the Winchester model 59. It boasts some 5 miles of glass fibers

SOLARGRAY, a glass that lets light in and keeps heat out, was developed for people who live in glass houses



glass will retain its total elasticity until it is broken. A high-strength glass rod will bend three times as far as a steel rod of the same size and length before breaking.

In Corning's Hall of Science they demonstrate elasticity with a 13-coil glass spring mounted in a showcase. Visitors are invited to push a button actuating a mechanism which depresses the coil to about one-third its length, then lets it spring back. To date, this glass spring has been depressed more than seven million times.

An even more dramatic demonstration of the strength and elasticity of glass was made during the 1961 Milrose Games. Using a vaulting pole composed of a myriad of glass fibers surrounded by plastic, the Marine Corps' John Uelses was literally catapulted to a new pole vaulting record of 16 feet, $\frac{1}{4}$ inch. The principle behind the unique vaulting pole was simply the utilization of the tremendous tensile strength of a single glass fiber, tensile strength being the resistance of a material to forces of rupture and longitudinal stress. Wound spirally into a pole, each fiber of glass was surrounded by plastic that acted as a restraining agent to keep the glass short of the fracture point, while maintaining the elasticity or "snapping power" of the pole.

This development in the world of glass created a storm of controversy in the sports world, but the identical principle has long been used in fishing rods, and is now being applied to golf club shafts.

Fiberglass boats and automobile bodies are common items today, but now a Cleveland company is manufacturing fiberglass front fenders to fit most popular American automobiles, and there is a new insect

screening made of fiberglass that will not dent, shrink, sag, ravel, corrode, rust or stain woodwork.

Among the most remarkable of the new glass-ceramics is Corning's Cerdur, which has a structural make-up of tiny, continuous honeycomb cells. A puff of cigarette smoke will pass through Cerdur with ease. Because it has this perfect cellular structure, giving an immense amount of surface area for its bulk, and at the same time has the ability to resist temperatures over 2,000 degrees Fahrenheit, it can be used to pipe searing exhausts from rockets and turbines where no other material would serve. Used as a heat exchanger, it appears to have solved one of the remaining problems in the application of the gas turbine engine—like the airplane jet—to passenger cars.

In the field of optics, Corning has been the first to produce a 100 percent-pure silica glass by condensing vaporized silica without the other constituents normally found in glass. Optically perfect, this glass has been cast into a 62-inch mirror that will be used in the U.S. Naval Observatory at Flagstaff, Ariz., to track stars up to 600 trillion miles from the solar system.

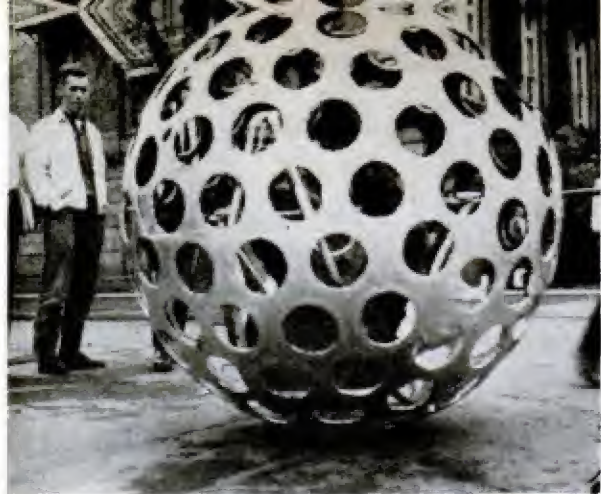
Thirsty Glass

To create a glass porous enough to absorb water, Corning uses acid to leach out almost all elements until it is 96-percent silica. Tiny disks of this "thirsty" glass—like miniature confetti—are placed in electronic components to trap trouble-making moisture. So voracious is the thirst of this glass, the disks are shipped immersed in deionized water, then dried out prior to use. Each

(Continued on page 198)

VERSATILITY of glass is practically limitless. There is a tough thermal glass (left) into which molten metal can be safely poured while the glass bowl sits on a block of ice. Among the many uses of molded fiberglass is the "tonneau cover" for the Ford Thunderbird. One company produces tiny porous glass disks (right) that absorb moisture at a fantastic rate. They are used in electronic devices to keep them dry.

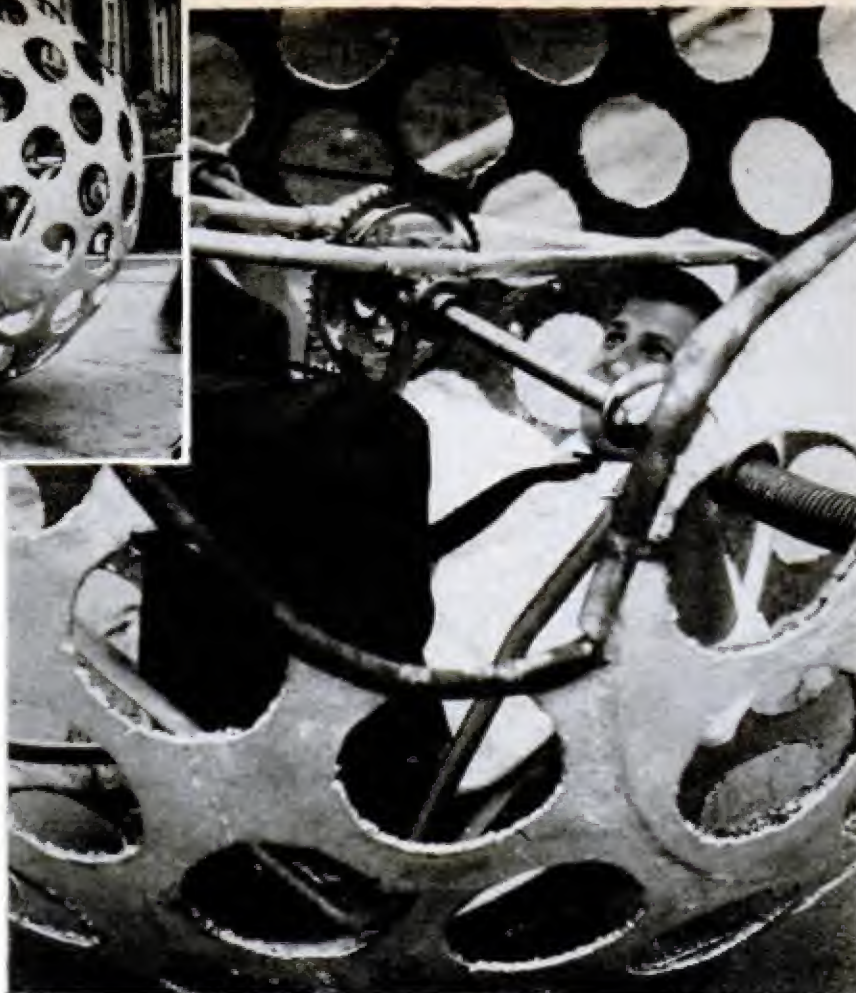




On the Ball

Conceived as an inter-city vehicle to be spun through pneumatic tubes, a perforated spherical vehicle also operates on road surfaces. The driver sits suspended from a horizontal bar; pedals cause his weight to be swung forward, in turn, causing the giant ball to roll.

Stephen Berni designed it for the Alcoa Student Design program.



For Fishing Fever

Temperatures of water at various depths can be found by lowering the sensing tip of the Fish-O-Therm and reading a dial on the handle. Fishermen then know how deep to fish for a particular species. The Minneapolis-Honeywell instrument sells for \$29.95.



Doghouse on Wheels

Dog-lover Charles Tumbridge determined to take his dog, Susie, along on scooter rides into the country; so he built her a "doghouse" sidecar. The mobile kennel has a sliding door, an observation hatch on the roof and blue-checked curtains.





Newly Launched Japanese Tanker Is a Giant

With the recent launching of the *Nissho Maru*, world's largest oil tanker, Japan set afloat a ship that can carry 35 million gallons of crude oil.

Built by Sasebo Heavy Industries Co.

for the Idemitsu Kosan Co., the 954-foot tanker carries the oil in her 40 tanks.

Shipyard workers (photo left) are dwarfed by the huge propeller on the 130,000-ton ship.

Reads Handwriting

An optical scanning machine designed to "read" handwritten material recently passed its first test with a near-perfect score. The experimental IBM unit is the forerunner of equipment the company hopes will some day feed handwritten data directly into high-speed computers.

To test it against a variety of handwriting styles, 150 students at Tufts University fed more than 100,000 random numbers into the unit on IBM cards. A light beam recorded them on an oscilloscope—with 98.5 percent accuracy.

Future units will transfer data to computer punchcards.



here comes UHF- TV!



How Will It Affect Your Viewing?

READY OR NOT, we're going to get UHF-TV. It's the law.

After more than a decade of offering UHF channels to prospective broadcasters—and getting only lukewarm response or none at all—the Federal Government, for all practical purposes, has *ordered* their use.

What does it mean? Is it good or bad? For the average viewer, it's an average of both. It means an additional cost, but a potentially better picture and a wider choice of programs.

(We'll pause here to allow the average disgruntled viewer to grouse about the choice of programs he has *now*. He would

probably settle for less quantity and more quality.)

The whole subject of UHF-TV, while basically simple, has been bogged down in controversy and confusion. Mostly, it has just been bogged down. To clear up some of the confusion and sort out the controversy, this report will discuss the significance of the new channels and the kind of picture and program quality you can expect from them, depending on location.

First of all, let's clarify what we are talking about. VHF (very-high frequency) and UHF (ultra-high frequency) are convenient names pinned on those portions of

the frequency spectrum on which television operates. AM and FM radio, for instance, occupy other portions of the spectrum. A chart on page 80 lists all the television channels and their frequencies.

The thing to remember is that VHF channels (2 through 13) operate on lower frequencies than UHF channels (14 through 83). This plays a part in the controversy.

So here comes UHF-TV? So what?

The average viewer—and more than 90 percent do their viewing on VHF—can buy a new set, convert his old set or ignore the whole thing.

If he buys a new set that will receive all channels, both VHF and UHF, it may cost up to \$30 more than his VHF-only set cost when new. If he converts, a conversion kit that will allow him to watch both VHF and UHF channels on his VHF set will cost about \$30, considerably less expensive than buying a new set. In either case, though, he will need a UHF antenna (UHF channels can't be received on VHF antennas) that will cost from \$4 to \$30 (see pictures).

If he ignores the whole thing, he might be 1) lucky, or 2) unlucky. If he's lucky, no new UHF channels will spring up in his area and he can go right on watching the old VHF channels as before. If he's unlucky, new UHF programs will be offered which he can't watch. So let's say he buys, or converts as indicated on page 82. What does he get for his money?

He gets what many experts believe is a superior picture, especially in color. Some



INDOOR ANTENNAS for UHF give poor pictures in fringe areas. Weak signals need outdoor antenna



OUTSIDE ANTENNA produces excellent UHF picture. Even electric razor does not distort it, as it would VHF

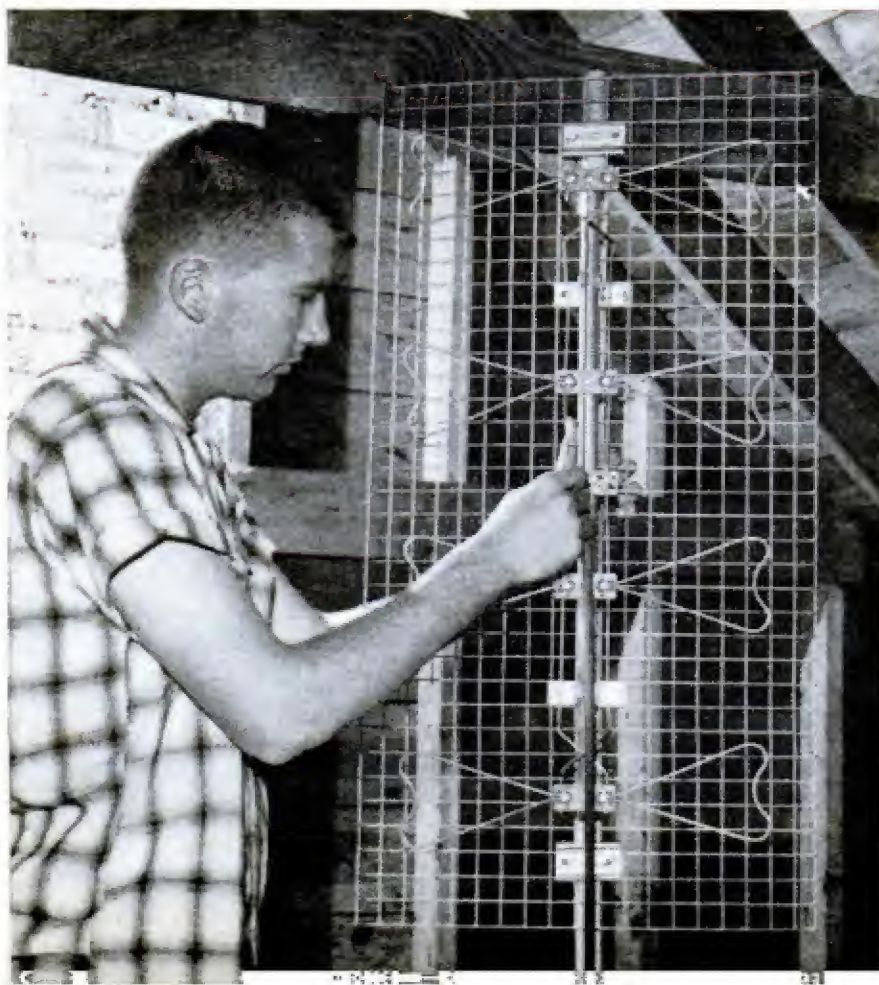


VHF PICTURE picks up interference readily from an electric motor, marring picture with splotchy horizontal lines. Test was in good reception area



UHF PICTURE, taken about same time as VHF picture at left, picks up hardly any interference, yet both sets were equidistant from station and interference

VHF		UHF					
CHANNEL	FREQ.	CHANNEL	FREQ.	CHANNEL	FREQ.	CHANNEL	FREQ.
	50	14	476	38	620	62	764
Ham		15	482	39	626	63	770
2	54	16	488	40	632	64	776
3	60	17	494	41	638	65	782
4	66	18	500	42	644	66	788
	72	19	506	43	650	67	794
Fixed Radio		20	512	44	656	68	800
5	76	21	518	45	662	69	806
6	82	22	524	46	668	70	812
	88	23	530	47	674	71	818
FM, Aero, CAB, Gov't, Ham, etc.		24	536	48	680	72	824
	174	25	542	49	686	73	830
7	180	26	548	50	692	74	836
8	186	27	554	51	698	75	842
9	192	28	560	52	704	76	848
10	198	29	566	53	710	77	854
11	204	30	572	54	716	78	860
12	210	31	578	55	722	79	866
13	216	32	584	56	728	80	872
		33	590	57	734	81	878
Misc. Gov't. CB, Ham, Radio-sonde, etc.		34	596	58	740	82	884
		35	602	59	746	83	890
		36	608	60	752		
		37	614	61	758		
	470						



FREQUENCY CHART shows positions of VHF and UHF on frequency spectrum, plus some of the other users—FM radio, government agencies (police and fire), amateur radio, etc. Frequencies are given in megacycles. AM radio, operating on kilocycles, is much lower than anything shown on this chart

FOUR-BAY ANTENNA, installed in attic, will be four times as efficient for UHF reception as single antenna. Additional surfaces increase its sensitivity

even predict that, once UHF is established, we might eventually become an all-UHF nation. The drawback is that, now at least, VHF stations generally have about a 50-percent greater range than UHF. This means that viewers in the fringe areas (say beyond 30-40 miles from the station) might not reap the full benefits of UHF.

Why these differences? Well, the lower frequencies of VHF have longer wave lengths and every meter of wave length gives you a certain number of miles of telecasting (or viewing) range. VHF also uses more antenna area in sending out (and receiving) signals than UHF does. As a result, VHF signals cover the telecast area more completely than UHF signals do, and VHF signals are usually less affected by obstructions such as hills or buildings.

Without obstructions, VHF signals generally carry about 50 percent further than UHF signals. With obstructions, VHF will usually bounce off and keep going. UHF will usually dissipate.

This sounds like a serious drawback, but it has hidden advantages.

The problem of range was a large factor in the early stagnation of UHF. Advertisers were much more interested in programs that would reach further (and consequently more viewers) with the same message.

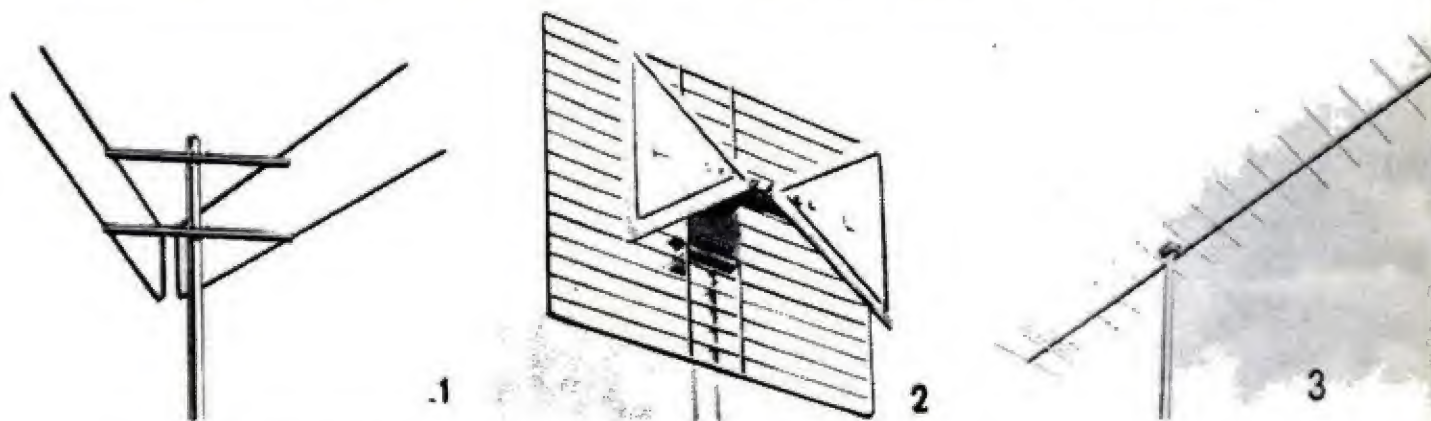
Range even affected early VHF. You'll note from the chart on page 80 that VHF stations are divided in two groups. There is

a large gap of 94 megacycles between Channels 6 and 7. (The gap is occupied by FM radio and others.) So Channels 2 through 6 operate on much lower frequencies than Channels 7 through 13, and most of the major stations (CBS and NBC affiliates, for instance) are on the lower channels, primarily because of the greater range. Economics, rather than esthetics, dictated the choice.

However, now that UHF is being forced upon the broadcasters, esthetics might win.

Interference-Prone VHF

VHF, even though it has greater range, also has its weaknesses. Because it operates at lower, more common, frequencies, it runs into considerably more man-made interference. Electric razors, vacuum cleaners and airplanes, to name a few, all use similar frequencies close enough to distort or destroy the VHF picture when both are operating. Such interference is almost nonexistent on the rarified, isolated frequencies of UHF. (On the other hand, some reflective objects may affect the UHF signal, especially in fringe areas. A UHF picture that was great during the summer, may grow fuzzy and snowy when the leaves come off the trees. Or the opposite may happen.) Actually, while VHF's ability to bounce off obstructions such as mountains sounds advantageous, the phenomenon can also produce annoying double (or "ghost") images in the picture you are getting.

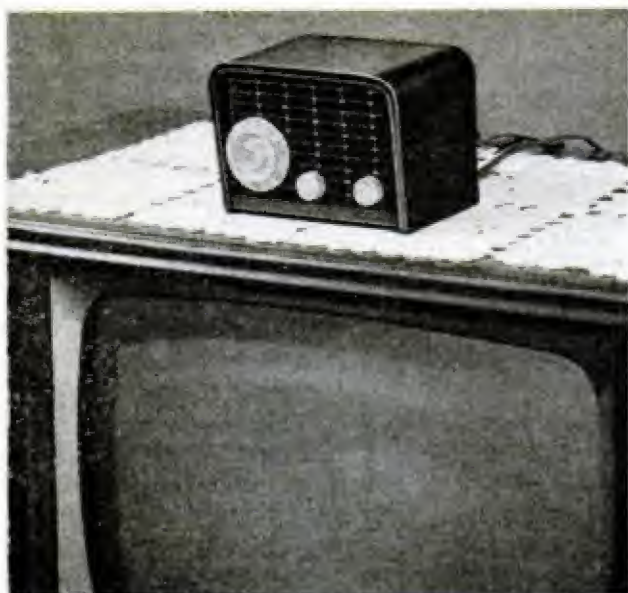


1. DOUBLE-V, simplest of UHF antennas, is adequate for close-in areas. It measures about one-foot across, and is least-expensive type. Approximate price: from \$4 to \$6

2. BOW-TIE antenna with flat reflector, also for local reception, is more elaborate and slightly more expensive. Also measuring one foot across, it lists from \$6 to \$8

3. YAGI antenna (named for Japanese inventor) measures up to 12-feet long and is designed for reception beyond local area. Arms measure one foot. Price: \$15 to \$20

4. PARABOLIC antenna with extra backward reflector, most elaborate of UHF antennas, is designed for extreme fringe areas. Large bowl measures 12-feet across. \$20-\$30



UHF CONVERTER, costing up to \$30, will enable VHF set owners to receive UHF pictures on their old set. Additional UHF antenna is also needed



REAR-END VIEW of converter shows where wires and plugs go. Full explanation for converting to UHF is given with diagram below. Or you can buy new set

Some people see an advantage to the shorter range of UHF. It could mean more and more small-town TV stations to serve more and more local areas, bucking the trend toward programming everything from New York or Los Angeles.

While it's possible more—many more—local UHF-TV stations will spring up, the experts see more hope for improving the range of UHF itself.

Once UHF catches on, there will be more money to spend, and more time and effort can be put into research and development, extending the range and improving the reception. More power and taller towers could extend the range, and more experience could improve UHF-set manufacturing and servicing in much the same way VHF sets improved after the early years of 7- and 10-inch screens.

Even now, UHF reception is not as bad as supposed. Good pictures—much better than VHF—can be received up to 30 or 40 miles from the station, with marginal coverage up to 70 miles. And where community cable systems are used (more on these later), some signals are being received 140 miles away. With two-thirds of the nation living in or near urban areas, well within “good reception” areas for UHF, the current state-of-the-art of UHF-TV is not bad. And it's bound to get better.

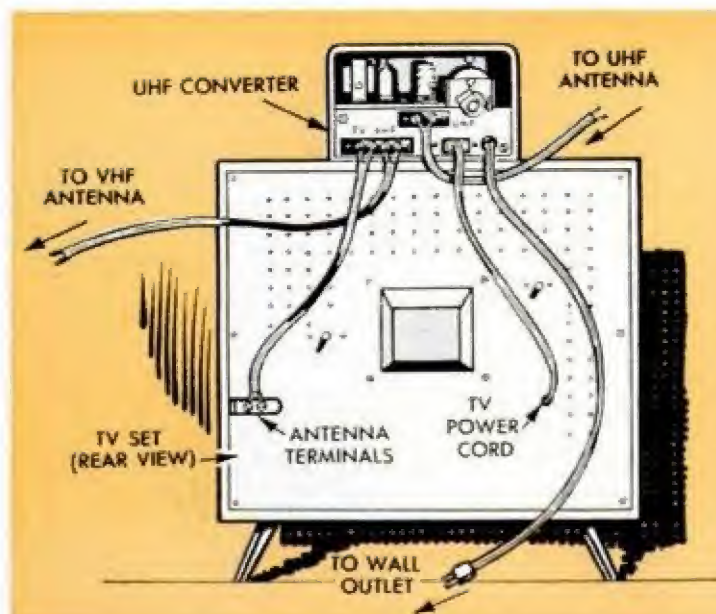
Why so sure? Because current UHF areas have done it.

Indiana-Pennsylvania UHF Tests

We mentioned that most of the nation watches VHF television. There are several isolated areas, however, that have been carrying UHF television exclusively for six years or more.

Two of them, in the flatlands of Indiana

[\(Continued on page 200\)](#)



The simplest way to make a VHF set do double duty is to add a UHF converter.

Place the converter atop the set, and disconnect the TV line cord from the outlet. Plug this cord into the convenience outlet on the converter. Connect your VHF antenna lead to the VHF terminals on the converter. Then connect the TV antenna terminal on the converter to the antenna terminals on the TV.

Add a UHF antenna to your antenna mast and run its lead-in wire to the UHF terminals on the converter. Now plug the converter into the wall outlet, and the conversion is complete.

To view normal VHF television, turn the TV set on, and the converter off. To see UHF channels, you must turn both units on, automatically switching over to UHF.



Make Your Own Decorative, Translucent Panels

With a kit of colored resins and a glass mat, you can produce in a couple of hours a weatherproof translucent panel that can be used indoors or out.

The panel itself is made by smoothing resin over the glass cloth (inset). When it

hardens, the colored resins are spread and squeezed on to make the design, which bonds permanently to the panel.

Illustra-Art kits, made by Inlay Design, Inc., 10117 Franklin Ave., Franklin Park, Ill., sell for \$10.95 each.

Floating Heliport

Solving the congestion of downtown Pittsburgh, the local helicopter service built its heliport on a barge. It boasts a ticket office, waiting room, office and landing pad measuring 54 by 90 feet.



Springy Teeter-Totter

Youngsters are treated to slides, jerks and slithers on a "silver pretzel" designed for them by University of Cincinnati students. Material used was a springy aluminum alloy structural tubing.



Road Testing **FORD'S CARDINAL**



By Heinz P. Schlichting, PM's International Editor

WE DROVE THE CAR that was supposed to be dead. That's right, the Ford Cardinal was buried some months ago.

But here it is—far-from-dead and in mass production at Ford of Germany's huge factory in Cologne, West Germany. There's just one important difference—the Cardinal now has a new name, the Taunus 12M.

Until last April, Ford had plans under way to bring this car into the U. S., knocked down into its component parts. In this way it would be much cheaper to ship by water and rail to assembly plants in the U. S.

Only the nameplates and instruments would have been changed from Taunus 12M to Ford Cardinal, while body stampings were to be welded together and painted. For reasons best known to its board of directors, Ford shelved this Cardinal operation and concentrated on bringing the Taunus 12M into the European Common Market where it will compete with Volkswagen, Renault's new R8 and the Kadett which is made by Opel, General Motors German subsidiary.

At first glance the Cardinal or Taunus looks very much an American design. It might have been a prototype for the Falcon that did not win approval from top management. Of course it is scaled down in size, being 167 inches long with a 99-inch wheel-

base compared to Falcon's 181-inch length and 109½-inch wheel base.

Compared to Volkswagen, Cardinal is a bit larger in exterior dimensions, some seven inches longer over-all with a five-inch longer wheelbase. Interior dimensions are close to VW's with the major difference being four inches more knee-room for rear seat passengers with the Cardinal's bench-type front seat adjusted to its rear-most position.

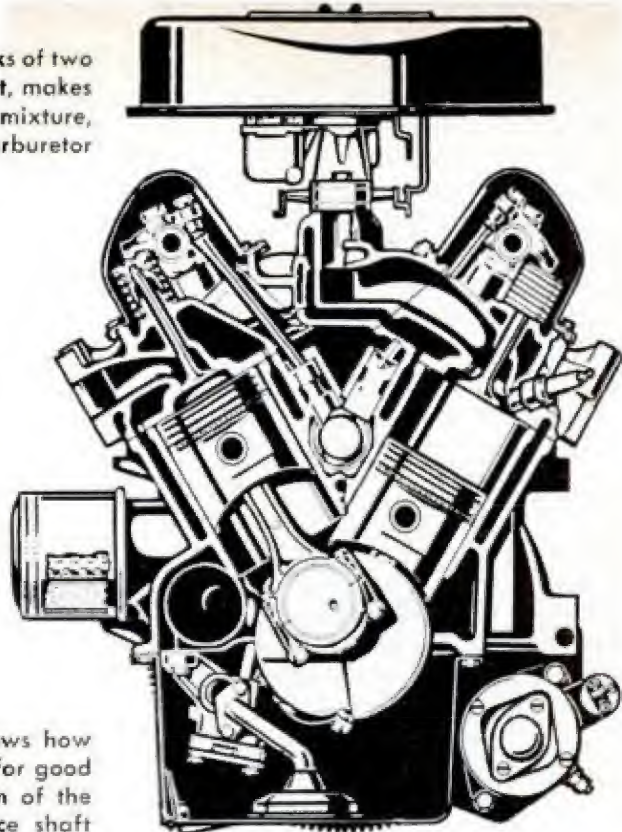
Beneath its conventionally-shaped body however, the Cardinal is quite as unique as the VW. First of all it is a front-wheel drive car with the engine placed forward of the front axle. The differential is located between the clutch and the four-speed synchronized transmission. The engine itself is a four-cylinder overhead valve watercooled unit with cylinders arranged in banks of two, set at a 60 degree angle.

Controls are conventional in arrangement with the gearshift lever located on the steering column.

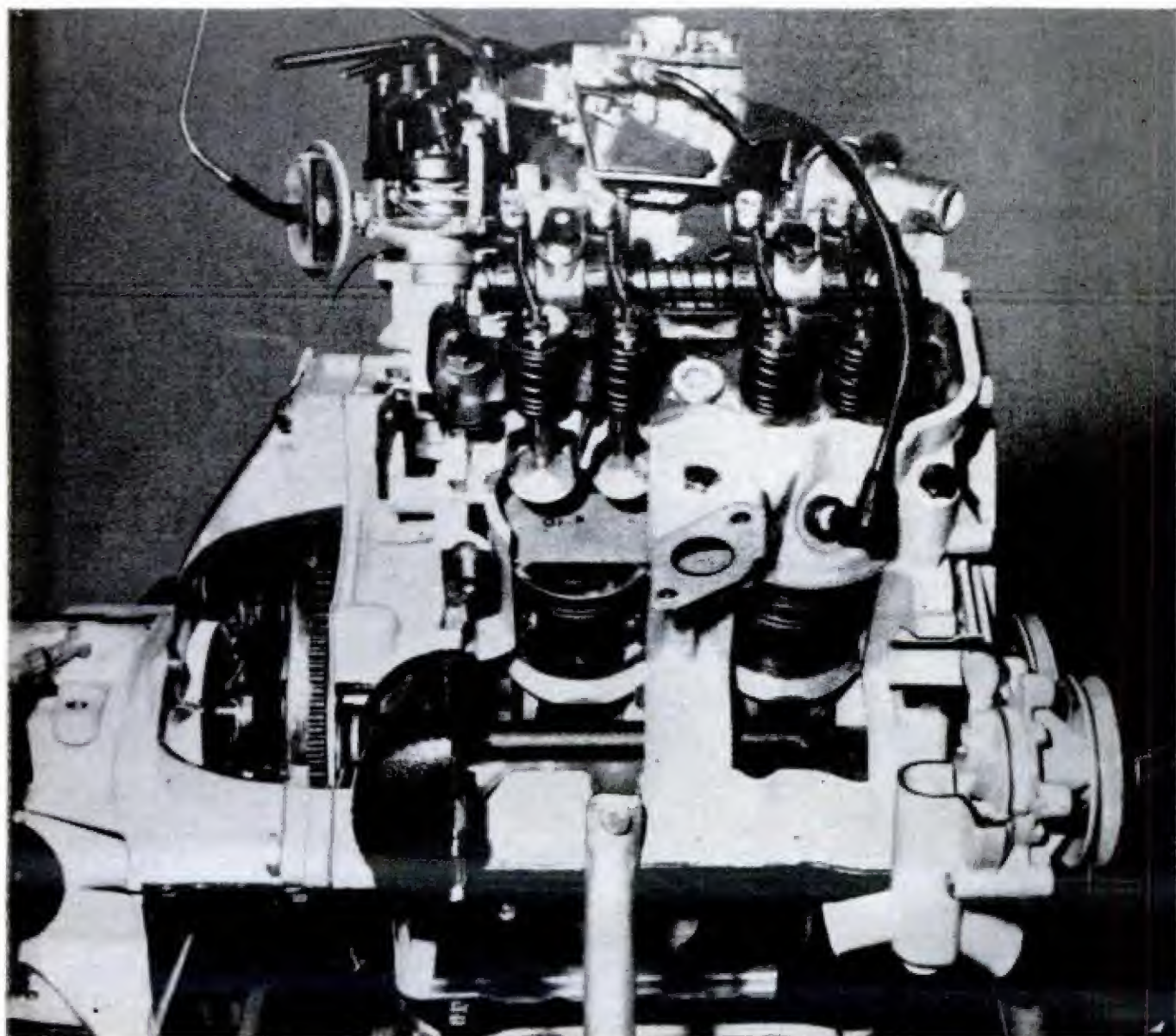
The V-type engine with cylinders placed opposite one another instead of in a line makes for a very short engine and a larger passenger compartment, with the rear seat forward of the rear wheel wells. Then, too, the absence of driveshaft tunnel or transmission bulge allows a flat floor in both front and rear compartments.



SHORT DISTANCE between banks of two cylinders on Cardinal's V4, right, makes for even distribution of fuel mixture, requires only single-barrel carburetor



SIDE VIEW of compact V4 shows how valves sit directly over pistons for good breathing. Black bar at bottom of the crankcase cutout is the balance shaft



In normal driving you cannot tell that the Cardinal is a front wheel drive car. The universal joints at the front wheels are of the Rzeppa constant velocity type, permitting smooth power flow even when the wheels are turned on their vertical axis to an extreme angle. The power surges or percussions sometimes felt through the steering wheel of a front wheel drive car were totally absent although we felt that slightly more steering effort was needed when cornering under full throttle in a lower gear.

The steering is recirculating ball gear (similar to U. S. types) with a 22 to 1 ratio requiring $3\frac{1}{2}$ turns from right to left lock.

Quite often the geometry of the front wheel drive universal joints cuts down the turning angle of the front wheels, necessitating a larger turning circle. But Cardinal's 35 foot turning circle is just two feet greater than Volkswagen's.

Handling is very good. The Cardinal can be cornered quite hard without any loss of control. There is no excessive understeer or body lean, thanks to a rear anti-roll stabilizer bar and an even distribution of weight.

Unlike some front wheel drive cars the Cardinal does not slew around when braked hard. It stopped as straight as if on rails, in a hands-off-the-wheel panic stop.

The car's ride is comfortable, due in part to the low amount of unsprung weight remaining to impart shocks into the body.

Front suspension is a single transverse leaf spring (an old favorite with Ford) coupled to the wheels via ball joints and acting together with a lower control "A" arms to locate the wheels. Rear suspension is through parallel-leaf springs attached to a hollow bar axle.

Brakes are drum-type hydraulic with a

total of 100 square inches of lining, quite enough to provide fast stops for the car's 1863 pounds of curb weight (2300 pounds test weight) with low pedal pressure requirement.

The four-speed transmission shares the gearing with the larger Taunus M17 which is generally rated the best shifting transmission on any European small car (better than most U. S. synchromesh jobs).

The four-cylinder engine runs smoothly thanks to a counterrotating balance shaft driven from the engine's crankshaft at the same speed. This shaft dampens out potential vibration inherent in a V4 of 60 degrees with counterweights out of rotation phase.

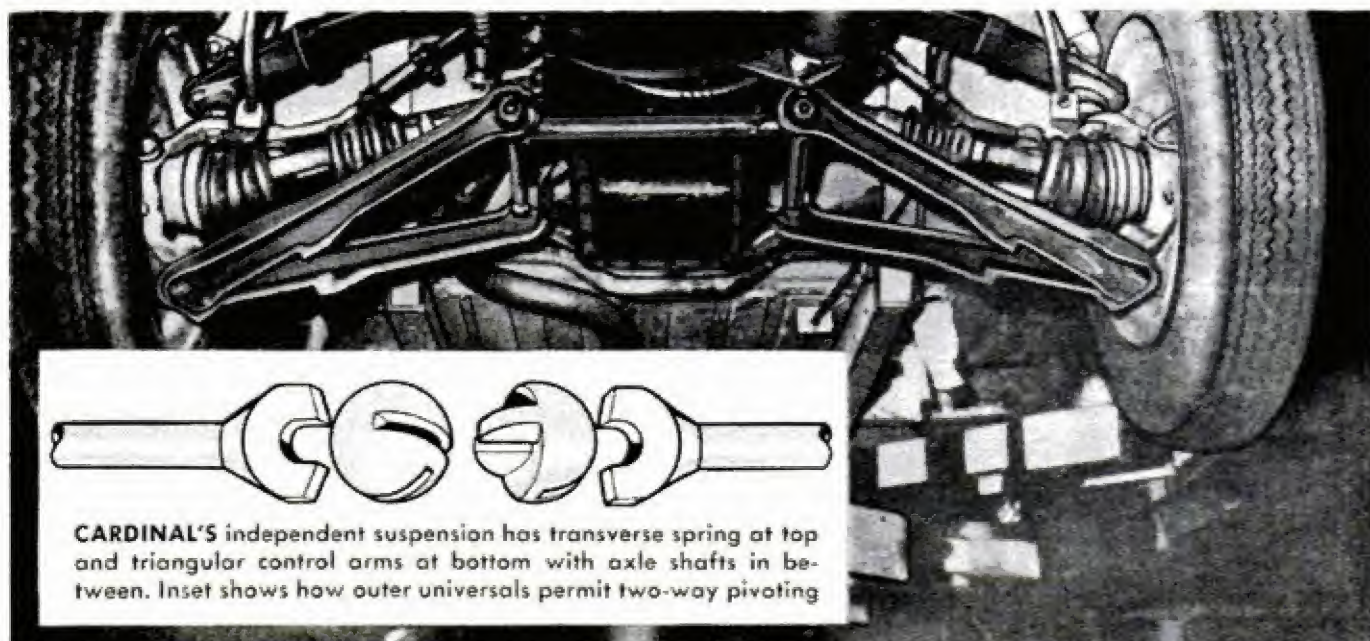
Although it can wind up smartly to over 5000 rpm in order to drive the Cardinal at its top speed of 78 m.p.h. through a 3.7 to 1 final drive ratio, there is little noise, due to the absence of a belt-driven fan. The fan's place is taken by a secondary radiator which is actually the heater core! A belt-driven pump constantly circulates water through the conventional front-mounted radiator and this heater core once the thermostat opens at 175° F.

When the temperature gets near the boiling point, as in summer traffic, a thermostatic switch turns on the heater blower which sends cool air from the cowl intake through the heater core then out through the bottom of the engine compartment.

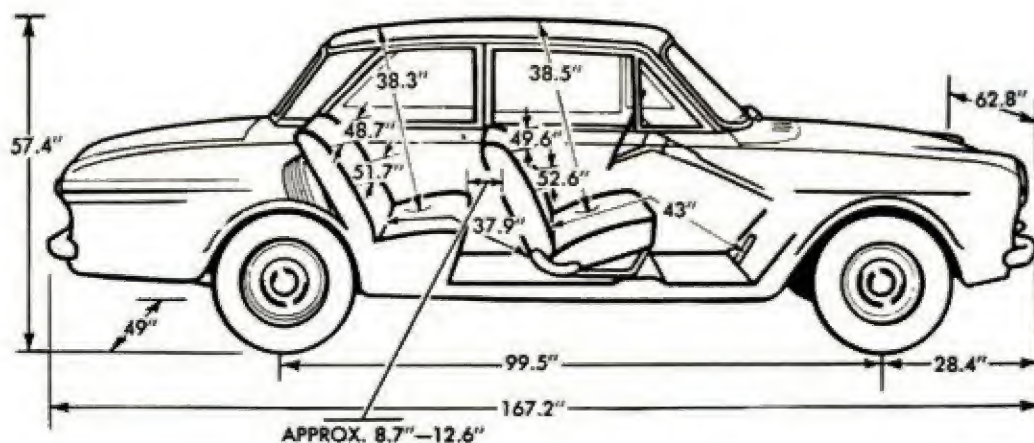
The Cardinal's unit construction body and sheet metal seemed strong. Sitting on the engine hood or decklid we could not depress the sheet metal significantly.

The Cardinal requires little routine maintenance, has no grease nipples. The two universal joints on each driveshaft provide four points to be greased every 6000 miles.

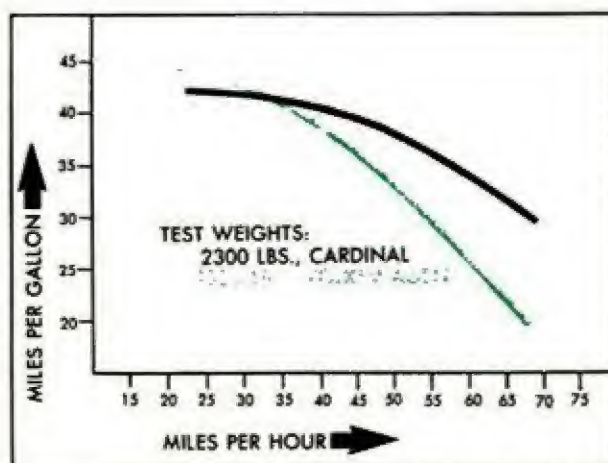
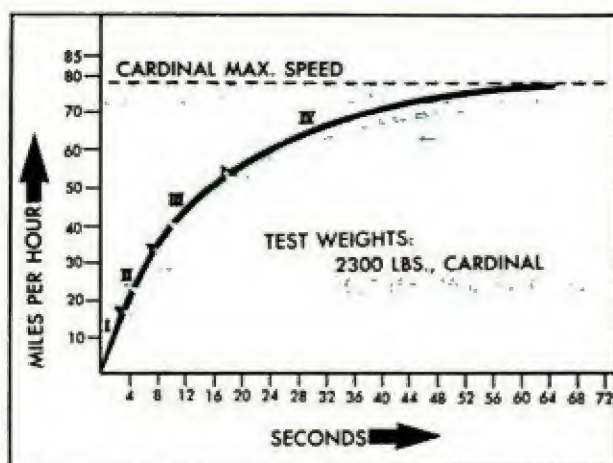
★ ★ ★



CARDINAL'S independent suspension has transverse spring at top and triangular control arms at bottom with axle shafts in between. Inset shows how outer universals permit two-way pivoting



The Cardinal is over 7 inches narrower than Rambler American, but rear seat hiproom, at 52.7, is 7½ inches greater



Although a bit heavier than the Volkswagen, the Cardinal has slightly better top speed, acceleration, and road-speed gas mileage. Roman numerals indicate gear speed ranges

At 99.5 inches, the Cardinal's wheelbase is just 5 inches longer than VW's. Over-all length is 7.2 inches greater and width 2.2, but the VW stands 1.6 inches higher than Cardinal





CONDOR'S BODY is aero-crimped, all-aluminum, fully-insulated and has a baked-enamel finish. For travel in all seasons, heat is furnished by a butane gas furnace, and an optional air-conditioning unit is available



BENCH-TYPE SEATS allow four diners to eat at the plastic-topped table. Driver's and other front seat swivel and recline



KITCHEN INCLUDES four-burner stove with oven and broiler, refrigerator, laminated-plastic counters, cupboard and drawers

The Condor Luxury Camper

Latest answer to "why not just pick-up-and-go?" is the Condor, a completely self-contained mobile home now available on order from any Ford dealer.

Developed by the Kelson Engineering Co. of El Monte, Calif., the Condor uses a modified Ford truck chassis and the 292-cubic-inch V8 engine with Cruise-O-Matic transmission. Wheelbase is 178 inches. The Condor is 26 feet long, with six feet, four inches of headroom inside.

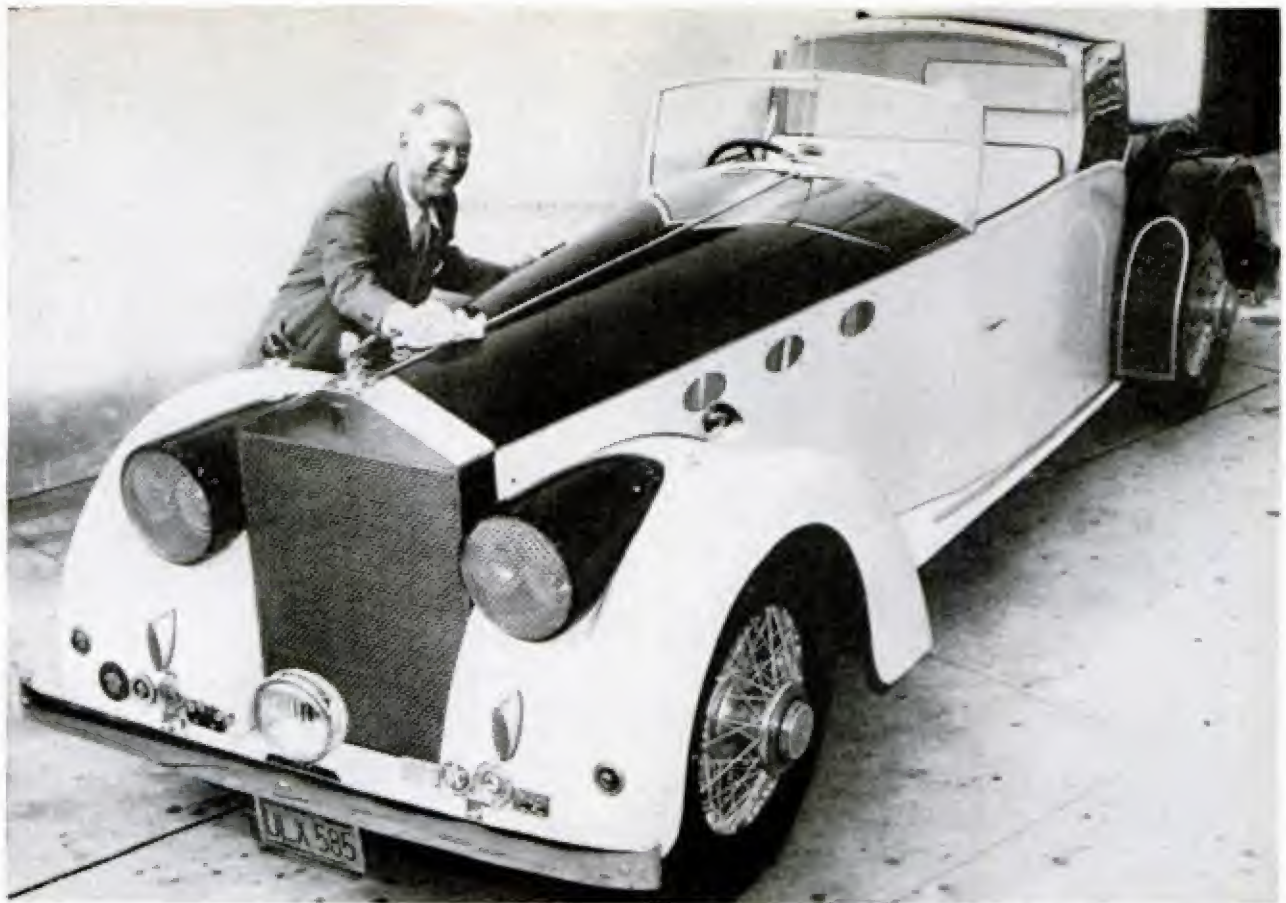
Complete kitchen, bathroom, dining and sleeping facilities accommodate six people. Interior appointments include walnut-grain plywood walls and ceiling and a vinyl-tiled floor.

Other features are: Shower with pressure water system; roomy cabinets and closets; dual-speaker radio; aluminum combination windows and screens; safety glass; and standard trailer-court hook-ups for electricity, drinking water, sewage and heavy-duty battery and alternator.

An optional 110-volt generator provides the luxury of using a full range of kitchen appliances, television, shaver, etc.

The vehicle will also double as a mobile office or showroom, movie or TV location dressing room, repair unit, or laboratory.

POPULAR MECHANICS



Driver of This Car Should Have a Pilot's License

Hardly any parts of this car were manufactured for an automobile; the classy vehicle is made of pieces of airplanes plus the engine from a fire truck.

The entire frame and skin of the car were formed from unused aircraft materials left over from World War II. The headlight cowlings are starter-motor housings from

a German jet engine; the engine magneto is the type used on Spitfire fighters. The door handles outside are flying wires from a biplane; inside handles are throttle levers from a Lancaster bomber. The 7.5-liter engine came from a London fire truck. Built by an RAF pilot, the car is owned by M. L. Cohn of Beverly Hills, Calif.



Transparent Hub Caps

Transparent boat-trailer hubs not only let you see the amount of lubricant available to the bearings, but they use 30-weight motor oil instead of conventional wheel-bearing grease and will survive countless dunkings without repacking. The maker guarantees the bearings for two years.

The Visi-Lube hubs are used primarily for original equipment, but changeover kits can be had at \$18 and \$20 from Visi-Lube, P.O. Box 10651, San Diego 10, Calif.



See/Hear Combo

Radio reception and a rear view are combined in Kar Tenna-Mirror which the maker claims is adjustable from the driver's seat and less susceptible to vandalism. Available with either 11 or 17-inch antenna for \$4.95 and \$6.95 from Wren Prods., 14680 Rochelle, Detroit 5, Mich.



No-Snow Snowmen

In San Diego, Calif., where it hardly ever snows, local residents create their own brand of snowmen by gathering tumbleweed from nearby desert areas, spraying it with whitewash and decorating the resultant figures just as if they were the real thing.

Apart from the sticky business of collecting the tumbleweed, these dry snowmen have several advantages. There are no frozen fingers or muddy boots, and the tumbleweed doesn't melt.



Artificial Sounds Soothe

Synthetic sounds to tranquilize or even induce sleep are produced by a transistorized, battery-operated instrument called the Soundsleeper.

Four press buttons give the sounds of surf, pattering rain, "white" sound, which is a mixture of all audible sounds blended at equal intensities, and modified white sound, which is ordinary white sound with the higher frequencies removed. The unit is intended for background use with the volume set to counterbalance distracting noises.

The Soundsleeper costs \$90 and is made by C. P. Electronics, Columbus, Ohio.



Piggyback Trailers Go Down to the Sea in Ships

Transcontinental cargo, normally shipped cross country by rail or truck, may now be floated from coast to coast by special container ships equipped to handle up to 476 fully loaded truck trailers.

Lifted unopened from the trailer bed, the containers are stacked neatly aboard

ship and sailed, via the Panama Canal, between Atlantic and Pacific coast ports.

Sea-Land Services of Newark, N. J., recently inaugurated the sea-going system. The railroads have been using the piggyback system of trailers over inland routes for many years.

a fresh concept:

the 'BOILING ENGINE' car



'Let 'er boil,' say the inventors. 'It's good for the car'

By James Joseph

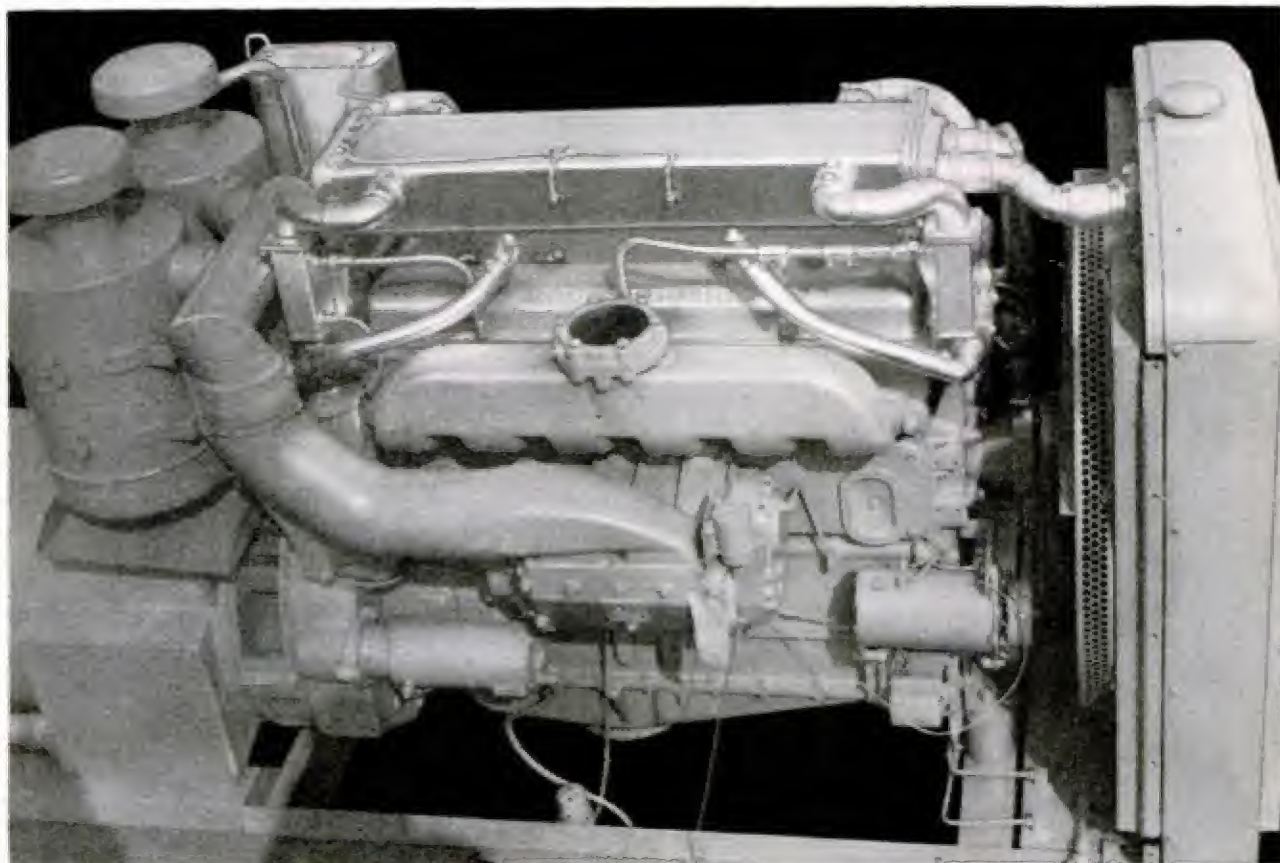
UP TO 10 TIMES the engine life and a virtual end to the build-up of carbon, varnish, and sludge—these are promised benefits from a new approach, Uni-Temp, which turns your car's cooling system into a "heating" system.

It splits the cooling system in two stages,

with the primary stage always boiling.

Uni-Temp, developed by inventors A. N. Anderson and A. A. Tacchella, helps lubricants flow at proper viscosity all year, doing a made-to-measure job of cushioning metal bearing surfaces that are kept within closer limits and have less tendency to ex-

SILVER-PAINTED parts on its top are all that's necessary to convert this diesel into a boiling engine



pand and bind, or contract and scuff. It also helps solve the problem of designing carburetors and intake manifolds as a compromise between winter driving, when the fuel-air mix requires preheating, and summertime, when a cooler induction system is desirable. The inventors even claim a seven to ten percent improvement in fuel economy is possible with Uni-Temp.

With a constantly hot engine, water vapor—a by-product of combustion—never gets a chance to condense in the crankcase and merge with sulphurous gases blown past piston rings to form bearing-eating acid.

The inventors' solution is to use coolant water's change of state to a gas as a built-in thermostat, by setting their operating level at 212° or a few degrees above.

When water surrounding the engine (in the primary of Uni-Temp's two systems) reaches 212° and boils, it rises as steam and carries heat up and off to a surface condenser where it is drawn off. Condensation cools this boiling vapor only a few degrees, however. As soon as the vapor condenses back to water, at or very near 212°, gravity pulls it back down into the engine block and the cycle continues, just as in your coffee percolator.

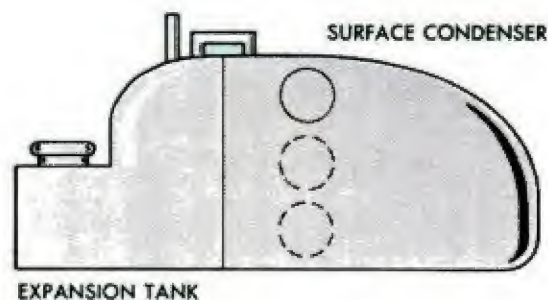
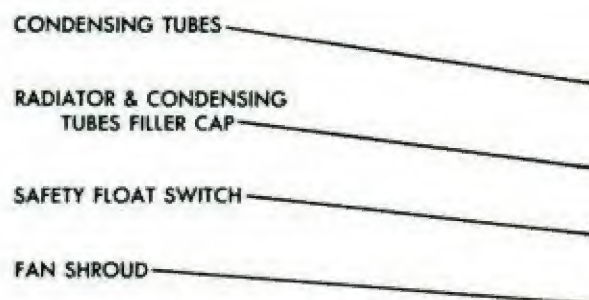
Uni-Temp's secondary system is the conventional radiator, fan, and circulating pump. It provides the cooling water that enables the condenser to remove heat from the boil-off steam and turn it back to water.

Uni-Temp limits the temperature spread from the top to the bottom of the cylinder to 2° to 5°. Conventional systems, besides having an operating temperature that can vary from about 180° to 205°, can have a top-to-bottom differential of 10° or even 20° within the engine block itself.

Thus Uni-Temp reaches the goal of higher engine operating temperatures that Detroit has been approaching with its pressure cooling systems and high-temperature thermostats.

The principle of running an engine hot for more efficiency has long been followed with industrial units. The Marine Corps Base at Twenty-Nine Palms, Calif., went to hot-engine operation for water pumps about five years ago to solve the problems of wear and extreme carbon build-up in the exhaust ports of truck-type diesel engines. Experimental boiling-engine trucks have been operating for some time. But it will be a while yet before Uni-Temp is ready for your car.

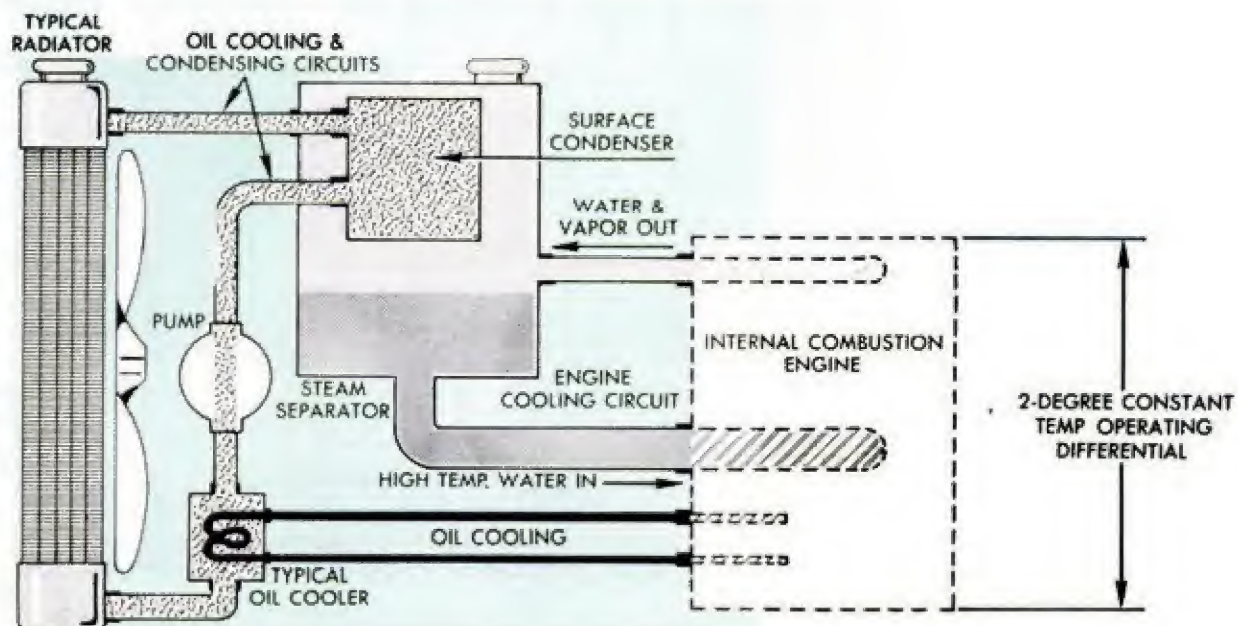
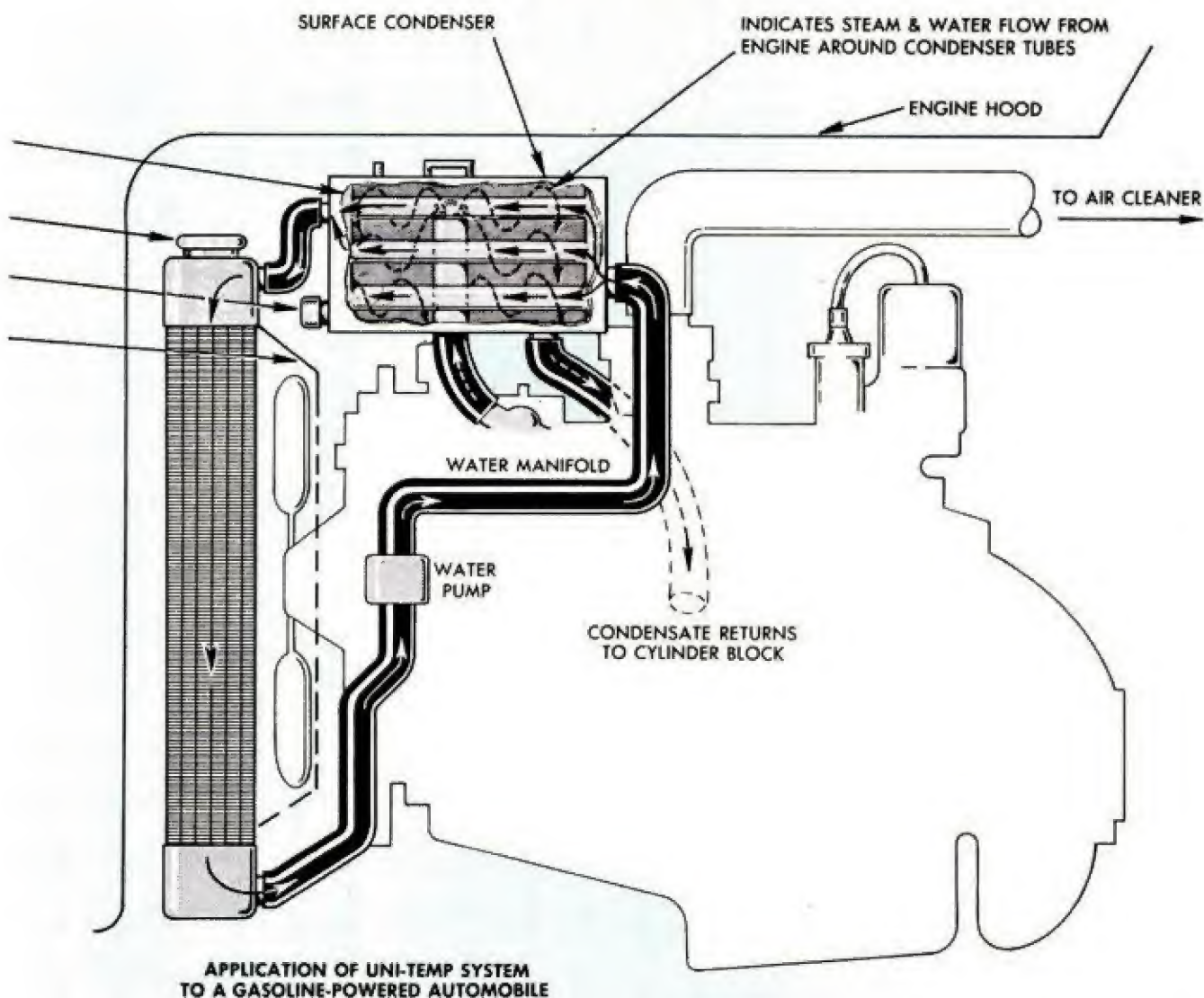
One kit just completed fits a General Motors truck engine. Another is in the works for inboard marine engines. Eventually others are planned for pickup trucks and cars. The cost isn't likely to pass \$100.



FRONT VIEW UNI-TEMP SYSTEM

STEAM AND BOILING WATER (broken arrows above) surge up from the water manifold to the condenser where tubes of cooler water (solid arrows) cool the vapor, condense it back to water. Condensate drains back to block, still close to 212°. Front view of the condenser shows the extra filler pipe, required because Uni-Temp's primary and secondary systems are separated

SCHEMATIC DIAGRAM at right includes the oil cooler which uses radiator water. A device of this kind is often necessary when a Uni-Temp kit has been installed





Front-Seat Locker For Vacation Trips

Maps, camera, film, vacuum bottle, sandwiches and other odds and ends all fit into snug compartments in a homemade car locker.

The locker rests on the front seat and is bolted in place with wing nuts through two unused holes in the dashboard. The lower unit, which holds four unbreakable glasses, sits on the shaft housing.

A plug-in coffee pot, hot plate and portable razor (in use) are also part of the catch-all. W. K. Northrup, Cleveland, Ohio, built the unit for his car.



Raise the Roof For Camping

Britain's sturdy utility vehicle, the Land-Rover, becomes a camper with the addition of an elevating fiberglass roof and a dormitory interior.

The Dormobile, a joint product of the Rover Co., Ltd., and Martin Walter, Ltd., sleeps four, has two upper and two lower berths six feet long, a two-burner stove, sink, storage cabinets, a collapsible dining table and plastic water tanks.

Sold in the U.S. by Land-Rover dealers, the camper is priced at \$5280 on the East Coast.



Assembly-Line Eggs

Wringers from an old washing machine and a belt of ordinary hardware cloth make an egg-gathering system for a Fruitville, Fla., poultryman.

The eggs roll down a slanted incline onto the belt, which is pulled through the wringer rolls. The rig is used to collect eggs in chicken houses as long as 300 feet. Regulating the pressure on the rolls determines the speed of the hardware-cloth belt.

● Frogs with built-in parachutes glide from tree to tree in some parts of Africa and southern Asia. Membranes between their toes, when spread rigidly, act as "wings" enabling the frogs to jump 50 feet.



Boat Trailer Doubles as Camping Shelter

Tired of the nuisance of getting caught in the rain when setting up or breaking a camp, an Oklahoma outdoorsman built a shelter over his boat trailer in such a way that it would serve as sleeping and living quarters, too.

Using corrugated aluminum siding, aluminum tubing for support and a folding rear door that can be locked, he built the shelter

long enough and wide enough to house the boat. These dimensions gave ample room for four folding bunks and kitchen gear, plus storage room for all his camping equipment while traveling.

A bonus benefit of the boat shelter is that it serves as its own garage during the off season. The aluminum siding needs little maintenance.

BOAT SHELTER, rigged for boat loading with floor boards and bunks out of way



AFTER LAUNCHING boat, shelter is turned into living quarters. Bunks, cooking unit (foreground) and shelves are set in place



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Of Lost, Stolen & Unclaimed Property Recovered By

CHICAGO POLICE DEPARTMENT

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AIR CONDITIONER — POWER LAWN MOWER — LADIES' & GENTS' WATCHES — RINGS — JEWELRY — TABLE MODEL RADIOS — CAMERAS — T.V. SETS — GOLF CLUBS — MISCELLANEOUS TOOLS — SHOES — MEN'S & LADIES' COATS — SUITS & FURNISHINGS — LUGGAGE — ROCKLATH — STATUE — RECORD PLAYER & RECORDS.

**AUTO ACCESSORIES AND TIRES WILL BE
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JEWELRY WILL BE SOLD AT 12:00 NOON**

TERMS OF SALE: Everything to be sold on an "as is where is" basis without any warranties of any nature whatsoever. All sales are for cash. Checks must be certified. No claims for postage will be recognized after the merchandise leaves the premises.

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GOING, GOING, GONE. The auctioneer calls for bids on a wide variety of goods at a U.S. Government sale

Here's a wonderland for shoppers. At public and private auctions you can pick up anything from automobiles to zircons—at astonishing savings

By M. Robert Beasley

RECENTLY A DETROIT man bought a \$350 German camera for \$25 from the police department, and drove home in a station wagon he had purchased for \$700 less than market value. In another section of the city, a private trucking company sold, among other things, a new \$300 refrigerator, with a few scratches on the side, for

\$45; a new 20-foot boat complete with out-board motor for \$75, and a table saw for \$35.

Bargains such as these are available to everyone in all major cities throughout the U.S. The simple secret is to find out when and where auction sales are being conducted by various Federal, state and local agencies and numerous private organiza-



BARGAIN HUNTER inspects jewelry and watches prior to auction, noting lot numbers and planning for bids

tions that warehouse goods.

Police departments in large cities hold regular public auctions, where everything from automobiles to zircons is offered to the highest bidder. Generally, material from this source is used. However, occasionally some confiscated merchandise, recovered stolen goods or objects abandoned for which no owner can be located, will be brand new. Whatever condition or value, all items in property storage are auctioned. Sports equipment, automobiles, cameras, typewriters, recording machines and tools are some of the many things available through these sales. A police auction, incidentally, is an ideal place to find a bicycle for Junior. There are always a number of bikes at a few dollars each. Through smart bidding, it is possible to buy a car, drive it a year, then trade it in on a new model, receiving a trade-in allowance higher than the auction price of the original car.

Items for sale can usually be examined before the auction begins. Mechanical objects sometimes require repair, but a general estimate of their condition is listed. No items are offered that are beyond easy repair, since derelict material is sold in bulk to junk dealers.

Public transportation systems and conservation and sanitation departments all require a wide range of articles that have been lost, recovered from theft, abandoned or otherwise unclaimed. These must be liquidated due to lack of storage space and complicated accounting. The price received for merchandise is incidental to the real problem of disposing of the goods as

quickly and easily as possible, so public auction is the logical outlet.

The U.S. Post Office Department holds the most frequent Federal Government sales. Each year the Post Office acquires upward of a half-million unclaimed or damaged packages, which will eventually be sold through auction. These sales include books, clothing, jewelry, tools and sports equipment—almost anything that can be shipped through the mails. As with all government sales, postal auctions are open to the public, and everything goes to the highest bidder over a dollar.

At all Federal Government sales, where there are similar items, they are often packaged and sold in lots. For instance, you might find three different cameras in one package, or a portable power saw grouped with an electric hand sander, or a typewriter and tape recorder as one lot. Although you might want only one item, the price for the entire package will usually be sufficiently low to warrant purchase. It is possible to sell the items you do not want, and wind up making money on the deal.

Notices of forthcoming Post Office auctions are listed in all newspapers and advertised on Post Office bulletin boards. Catalogues of merchandise are distributed free at the gallery before each sale. Persons who request their names be added to regular auction lists can receive advance notice and catalogues through the mail.

A 50-percent deposit is required on all purchases, payable upon acceptance of a bid. Merchandise cannot be claimed during the sale, but must be picked up within a few



SPORTING GOODS, furniture, bric-a-brac—there is no limit to merchandise offered at public auction

days and the balance paid in cash or certified check.

New York and Chicago have the largest "dead parcel" branches, requiring three or four auctions annually. Most major cities will hold two auctions a year, depending upon volume of goods accumulated. During January and February there are sales in almost every city to dispose of the mountain of merchandise acquired during the holiday season. Your local post office will have information regarding time and place of sales.

Excellent bargains can be found at sales conducted by the U.S. Customs Service. Public notice of these sales is posted in Federal buildings and advertised in local newspapers, usually in the classified section. For personal advance notice, send a letter to the Collector of Customs, in the nearest

ORNATE GLASSWARE and silver are examples of what this smart housewife may buy at fantastic prices





LOADED HAMPERS hold the wide range of goods on display prior to a U.S. Post Office sale. Items bought in lots may be resold individually to realize a profit

port of entry. A complete list of the locations of the collectors of customs can be received by writing to: Bureau of Customs, Treasury Department, Washington, D.C. All sales are conducted locally and information pertaining to dates of sales must be obtained from the local port of entry.

Most items purchased at a Customs sale are new. There are exceptions, of course, such as luggage that might have been abandoned or confiscated, and automobiles seized in illegal activities. Practically anything can turn up at a Customs sale: jewelry, furs, clothing, cameras, imported wines and liquors. This merchandise has been seized from smugglers, or abandoned on docks or ships in lieu of customs payments. It is possible to purchase \$50-ounce French perfume for as little as two dollars, or a \$1000 watch for \$50.

In addition to Customs and Postal sales, the government holds auctions through the General Services Administration, the Internal Revenue Service and several other agencies. The local office of any government agency will give you required information about all sales of their organization.

Some government auctions require that a small deposit, ranging from \$10 to \$25,

(Continued on page 188)

LUCKY FISHERMAN finds a typical public auction value. The new rod and spinning reel that he inspects will be bought for just a fraction of its retail value



Steering Wheel for Sleds

Something for the future Olympic champion is a steering wheel that converts a regular sled into a bobsled.

Developed by S. L. Allen & Co. of Philadelphia, the steering wheel is available in a converter kit adaptable to the Flexible Flyer and Yankee Clipper sleds, and is priced at \$6.55.

Easily installed and removed, the steering assembly allows a youngster to sit erect and steer his sled like a regular bobsled.

Besides offering more thrills on the neighborhood hill, the converter is a safety feature. In the sitting position face and head have greater protection.



Mixed-Up Corn Combo

Adjusted combines can now be used to harvest two types of corn-cob mix as well as shelled corn, report John Deere engineers.

One adjustment adapts the combine to shell the corn, break the cobs into pieces about one inch long, and deliver the mix to the grain tank. Other adjustments adapt the combine to crack the kernels and break the cobs into smaller pieces.

One basic harvesting machine reduces the investment in farm equipment, spreads fixed costs over more acres, and makes more money available for other farming enterprises.



Self-Feeding Art Pen

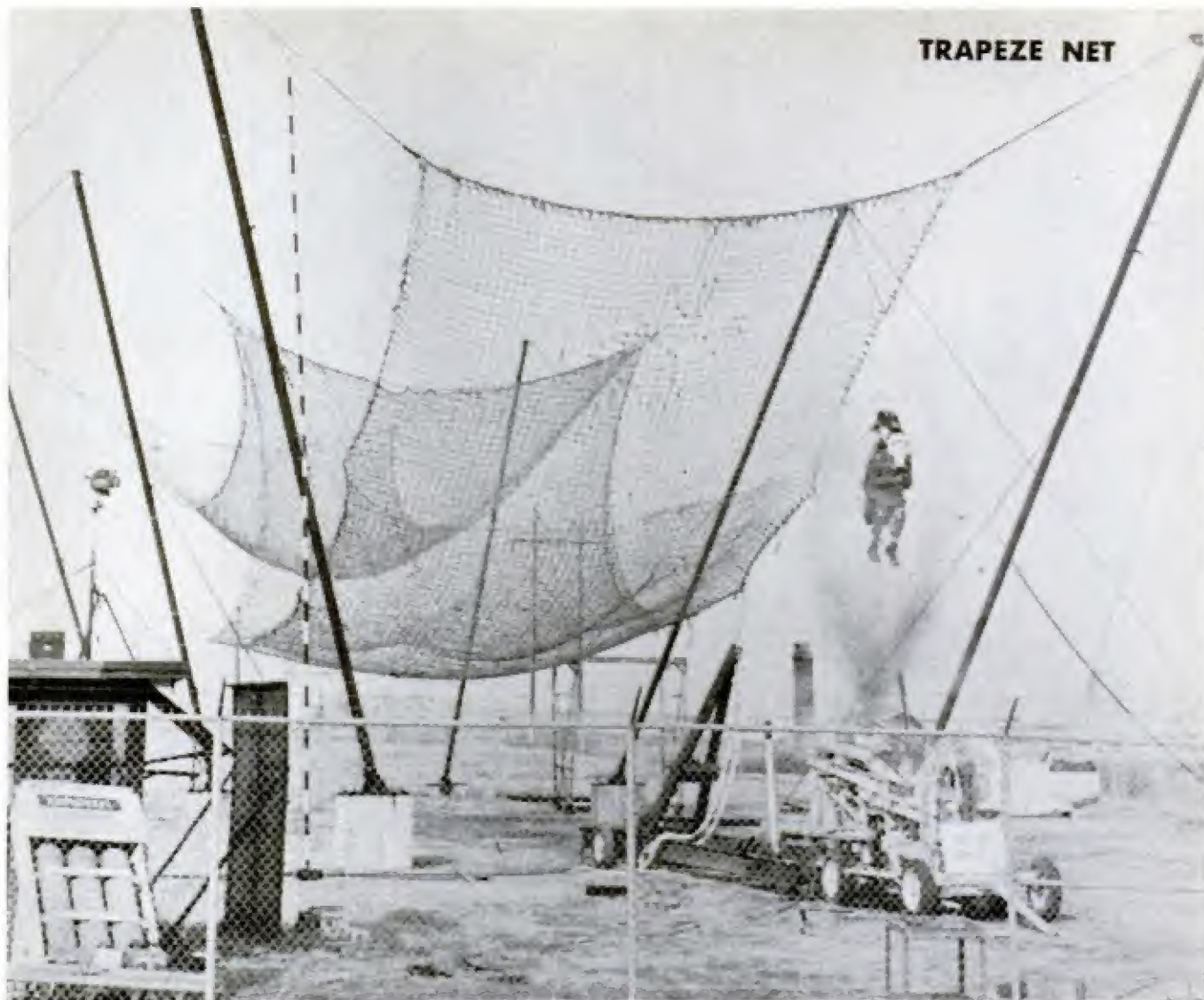
Artists and letterers have an ample reservoir of ink when using a new pen that eliminates the need to load the point with quills or droppers. It is filled by a plunger mechanism in the side of the barrel, like a fountain pen, and can be used with any size or style of Speedball point.

The pen is molded of lightweight black plastic with gold trim and has a screw-on cap with a pocket clip.

The pen costs \$2.95 and is made by C. Howard Hunt Pen Co., Statesville, N. C.



● Seven of the world's ten highest mountains are in Nepal, Asia.



TRAPEZE NET stands ready to catch dummy pilot during tests of supersonic jet's rocket ejection seat

Look What It Takes to Build Airplanes!

THE WRIGHT BROTHERS used bicycle chains to turn the propellers of their first airplane and Glenn Curtiss used inner-tubes as wing floats for his first seaplane.

Aviation hasn't changed much since. Commonplace items still find uncommon use in the making of even today's supersonic jets.

At the Ling-Temco-Vought plant in Texas, where they make the Navy's F8U Crusader carrier fighter, such things as...

Table-tennis balls are tossed in acid baths used to chrome-plate aircraft parts. They absorb the highly poisonous acid fumes.

Honey bees and house flies are blasted against windshields in tests to find ways to remove insects in flight.

Dentists' mirrors help aircraft inspectors peer into small openings; stethoscopes help detect air leaks in pressurized-plane cockpits; tongue depressors spread gummy sealants on joints; and hypodermic needles squirt oil on small ball bearings.

Circus-trapeze nets catch dummies shot from cockpits in ejection-seat tests.

Undertakers' gloves are used by men in "clean rooms" to keep the infinitesimal stain of their fingerprints from critical airplane parts.

Plain smoking tobacco is used to blow smoke into pressurized cockpits to test the tightness.

Meat hooks suspend metal templates.

Cupcake tins and cardboard cuspidors are used by the thousands to store rivets, nuts and bolts.

Goopy liquid soap lubricates honeycomb material used in machining parts for the huge new RS-70 supersonic bomber.

Liquid shoe polish takes the glare off instrument panels.

Ground-up pecan shells are tossed into jet engines to "clear their throats" of dirt and oily accumulations.

No one yet, however, has found a use for the kitchen sink.

PAILBEARERS' GLOVES are worn by engineers to keep fingerprints off metal in aircraft "clean rooms"

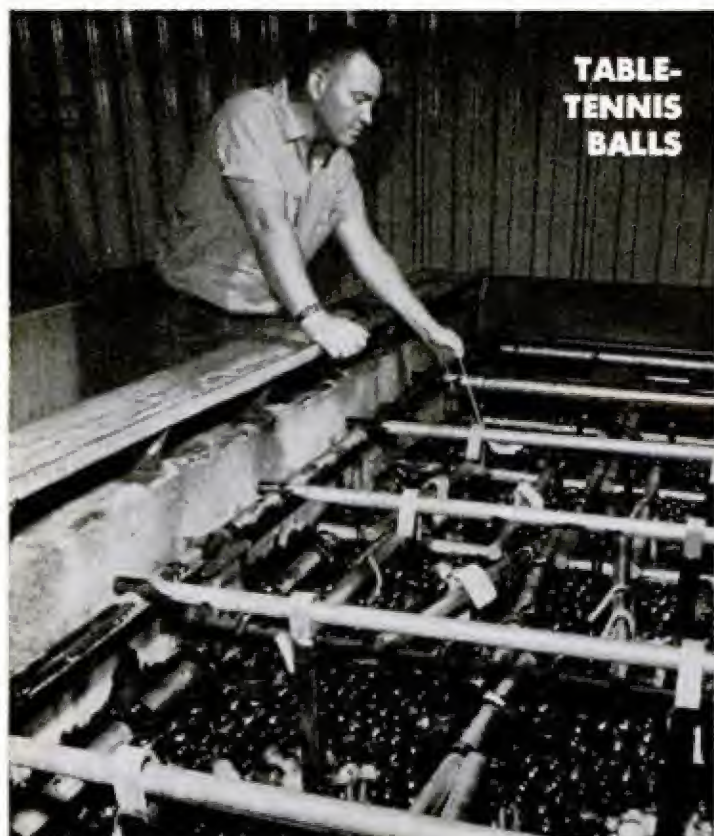


STETHOSCOPE

AIR LEAKS are more easily detected by using physician's stethoscope to listen for small irregularities



TABLE-TENNIS BALLS



BALLS float in vat of acid, absorbing deadly gas fumes

DECEMBER 1962

BEEES



BEEES, sucked out of container, blast against windshields

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Table-Tennis Rack

Table-tennis balls and paddles are held neatly in place with a new plastic storage rack. The wall-mounted rack dispenses balls one at a time.

Made by F & M Mfg. Co. Inc., 1653 Northeast Parkway, Wichita, Kan., it costs \$3.98.

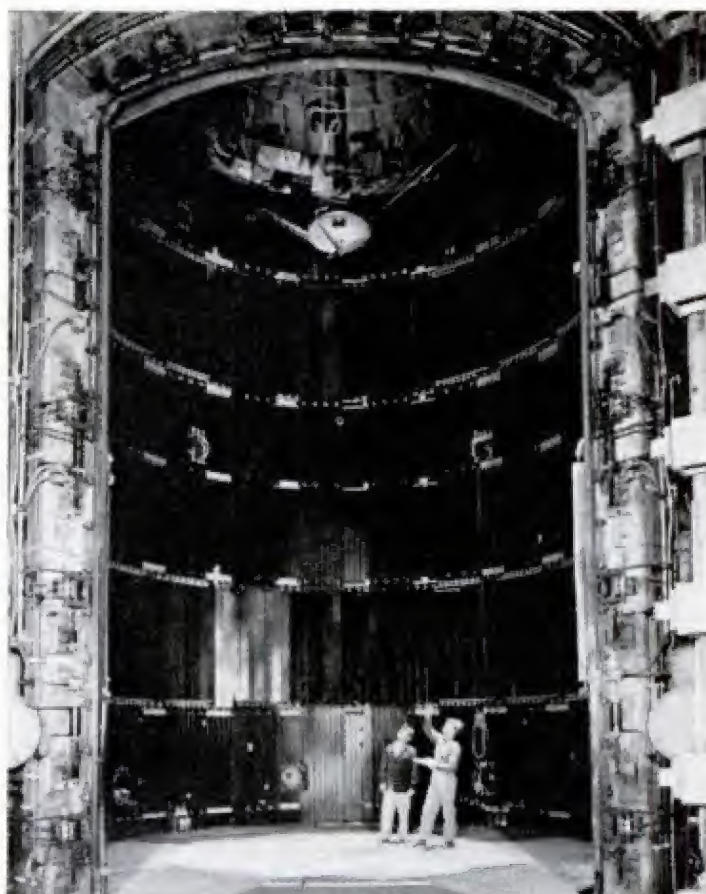
Formidable Footwear

Aerating a lawn is simply a matter of strolling across it when you're wearing a set of steel spikes strapped to one foot. Five spikes enter the ground every time the wearer of a strap-on aerator takes a step.

The aerator is available from Hurst, Kelvedon House, Artillery Lane, London E. 1., England.

● **Lake Baikal** in Russia, with a depth of 5315 feet, is the world's deepest lake and Eurasia's largest body of fresh water.

● **Mexico's Pyramid of the Sun**, rising as high as a 20-story building, was ascended in pre-Columbian times by priestly processions to pay homage to their supreme god, Quetzalcoatl. An archeologist has estimated that construction occupied 10,000 laborers for 20 years.



Space Brought Down to Earth

Towering 80 feet high and 27 feet in diameter, a space simulator will expose spacecraft to be used in probes to Venus and other planets to the heat, light and vacuum conditions they will encounter on these long space voyages.

Artificial sunlight is generated by 131 compact lamps through a system of mirrors.



We're Fighting a Hot

Old standards of calibration, once more than enough for the state of the art, are now hopelessly outdistanced in the Space Age that requires infinitely greater precision in measuring "the pint, the peck and the pound"

By Theodore Berland

WHEN THE RUSSIANS rocketed Sputnik I into orbit in 1957, they caught us with our space program down. In our national state of shock, the "sour grapes" reaction was that it was just a publicity stunt.

As the Soviets continued to launch larger and larger satellites—and stay far ahead of us in the race for space—the easy excuse was that their rockets were merely big, capable of big payloads, nothing more.

Even when they sent the first man into orbit, and followed it up with a 24-hour manned orbit, the die-hards were still scowling that the Reds had plenty of missile muscle and were just showing off.

But last August, when Russia launched two separate manned satellites on two successive days, and sent them traveling around the earth so close together that the cosmonauts could see and communicate with one another, even the die-hards had to admit that there might be more to Russian achievements than mere muscle.

As long ago as the first Sputnik, however, the more sober voices among us were warning that it took more than sheer power to orbit an artificial satellite—that the power had to be regulated, and to very close tolerances.

The scientists who said this had seen us make the same mistake before. In 1949, when the U.S.S.R. exploded its first atomic bomb, the excuse was that Soviet scientists had stolen our secrets. But even with all the information that spies had funneled to them, the Russians could not have made an atomic bomb, and then a hydrogen bomb, unless they could measure certain things ultra-accurately.

Looked at one way, the Cold War is a Measurement War, a battle of skills and of more and more precision.

For decades, our National Bureau of Standards—the nation's custodian of "the pint, the peck and the pound"—had all of the precision anyone could want. It could measure things far more accurately than

America's—or any other country's—technological needs.

During World War II, when precision manufacturing and electronics made big steps forward, the standards people were there, helping industry. After the war, while the bureau's budget was chopped down and measurement research crawled, industry's precision requirements raced on.

Sputnik was the big eye-opener. For one thing the Russians were evidently able to measure million-pound rocket thrusts to great accuracy, while we could measure accurately a top of 111,000 pounds.

At a million-pounds thrust (which we didn't have) we could measure within half a percent, for an error of 5000 pounds of thrust. Yet an error of only 1500 pounds of thrust would be enough to throw a lunar or interplanetary rocket off target.

To travel to Mars, Venus and beyond, rockets must have thrust accuracies of .001 percent.

It was the rocket builders, in fact, who first complained that a "measurement pinch" threatened space and military projects. For the first time in the nation's history, technology was ahead of calibration. Specifications for new gadgets called for closer tolerances than anyone could accurately measure at the time.

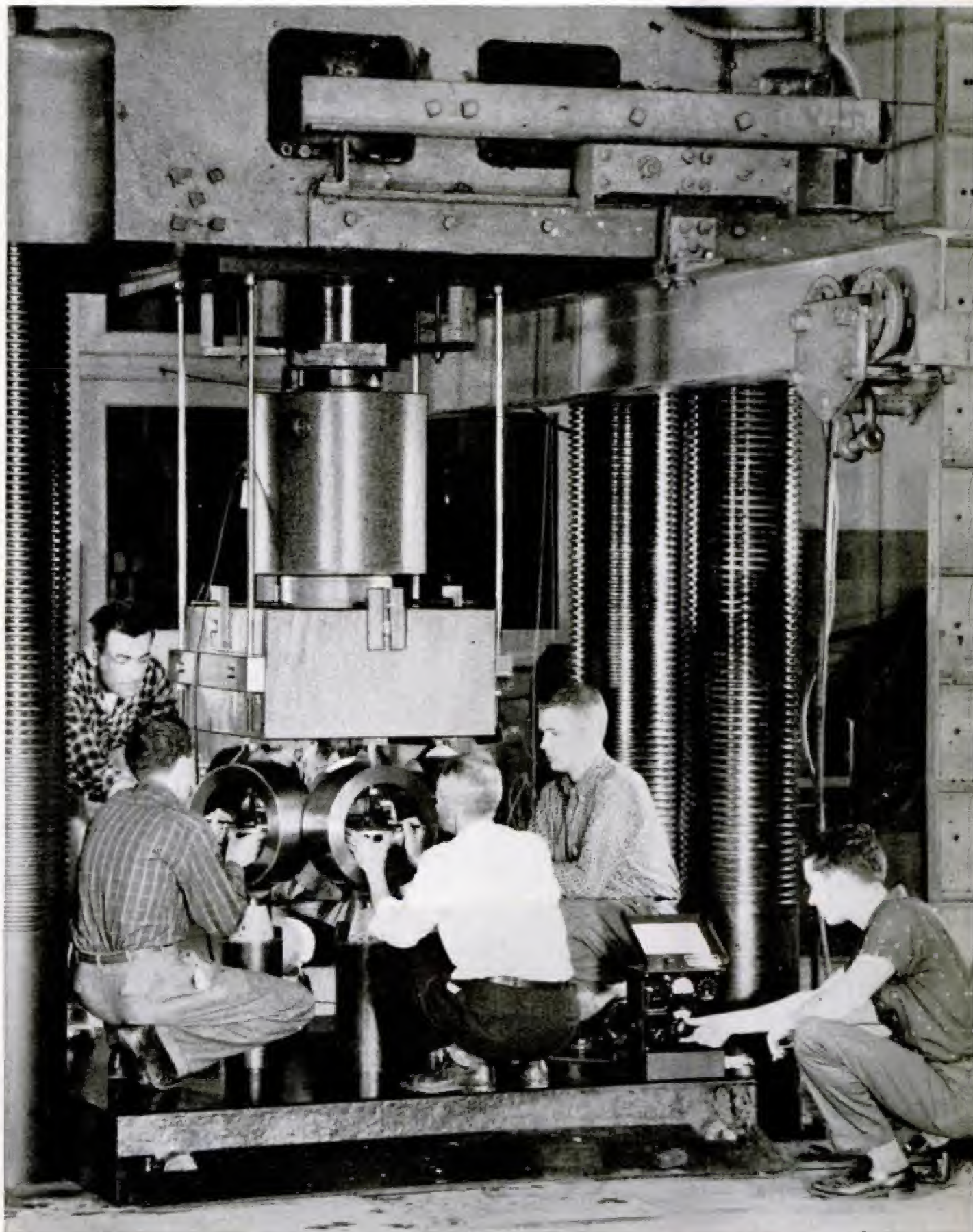
Flintlock Moon Shot

"We seem to be shooting for the moon with a flintlock," said one member of the Aerospace Industries Association. "Horse-and-buggy measurements aren't good enough for space work," said another.

And the measurement pinch was costing us money. One manufacturer of gears for inertial guidance systems was charging the Government \$80 per item, though each gear cost only \$5 to make. The reason for the difference was simple: the gears couldn't be measured within the 50-millionths of an inch tolerance required. So the gears were made in lots, then fitted. Those that fit best were accepted, the others thrown away.

Measurement War

NEW LOAD CELL at NBS has the capacity for testing rocket engines with thrusts of up to 1,500,000 pounds



Last year members of the AIA met near Phoenix, Ariz., to air their measurement problems. The meeting was a milestone in a way, because until then aerospace manufacturers were afraid to talk about their problems, for fear they would lose big Government missile-and-plane contracts. But everyone in the industry had the same problems.

Take the case of a manufacturer of radar power tubes who complained that, "As yet, the methods for measuring peak power are not sufficiently accurate."

What happened? "As a result, overdesign is required. Time is lost both in rechecking production and in research and development. Expensive tubes, which may cost from \$30 to \$40, may be rejected unnecessarily." And if the tube accepted didn't perform perfectly, \$37,000 worth of radar equipment built around it would have to be scrapped.

Confessed another large electronics manufacturer: "In specifying modulator transformers, an error due to inadequate measurement information could cost \$100,000 or more."

And, said another, "Of the 10,000 components per month that must be inspected, up to 30 percent may be rejected. But, the biggest problem is that they are not absolutely sure that the accepted items meet all the requirements..."

There was also the \$50,000,000 contract to develop a spacecraft to make a soft landing on the moon. The whole project was in jeopardy because there was doubt that its electronics could be made accurately enough to transmit a distortion-free TV picture back to earth.

The measurement pinch pointed up an old truism: American industry is based on measurement. The whole secret of mass production of interchangeable parts—which made assembly lines possible—was that a bolt made in Chicago would fit into a cylinder block in Detroit. Or that a vacuum tube made in New Jersey would fit mechanically and electronically into a chassis in Los Angeles.

And science, which gave industry its ideas, was based on measurements, too.

To assure that all of its measuring instruments were synchronized, each big manufacturer for years had its own master standards. To calibrate an inch micrometer caliper, it kept an inch gage block. The block used by the field unit had to be accurate, say, to plus-minus .003. Periodically, this field block was checked against a block at the company's base office, accurate to plus-minus .001. And, every so often, this base block was checked against the company's



master inch block, accurate to plus-minus .0003. Every few years, the master company block was taken to Washington and checked against the National Bureau of Standards's block, which had an accuracy of .0001. NBS thus calibrated some 6000 gage blocks annually.

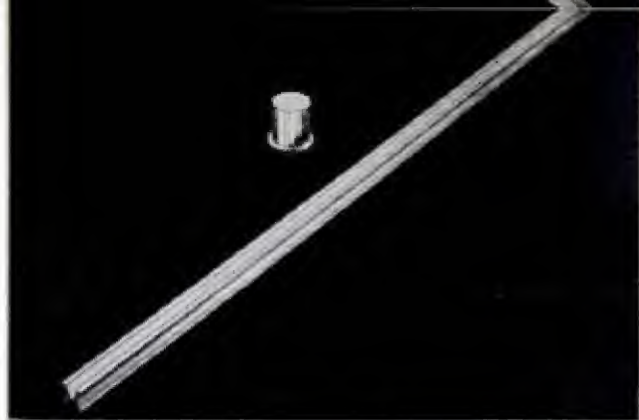
This range of precision was fine in the old days. Today, the field block is likely to have a plus-minus .0001 accuracy. This means the NBS's block must be accurate to two millionths of an inch (.000002 in.)!

The revolution in measurement needs wrought a revolution in measuring things.

Take length. For over 70 years two finely engraved lines on a platinum-iridium bar defined the meter. Periodically our well-guarded national meter was flown to Paris and checked against the International Meter Bar.

Today, the standard of length is the unalterable wavelength of the orange-red light of krypton-86 gas. A meter is now 1,650,763.73 krypton-86 wavelengths. An inch is 41,929.399. Length (and gage blocks) can now be measured more accurately than ever before. And the national standard doesn't have to be checked in Paris.

Time, too, has gone atomic. The NBS (and the nation's official timekeeper, the U.S. Naval Observatory at Washington) measures time by the beatings of cesium atoms. So constant is this beat, that a



PLATINUM-IRIDIUM BAR (above) was replaced as national standard of length. It is shown with standard of mass

GAGE BLOCKS (left) are kept by every industry to calibrate measuring instruments, and checked periodically with NBS

KRYPTON-86 LAMP (right) emits orange-red light and light's wavelength is now used as national standard of length



watch, comparably accurate, would lose less than one second in 3000 years.

Why such accuracy? Try tracking a satellite orbiting at a speed of 25,000 feet per second. If your watch is but a tenth of a second off, the position you report for the satellite is a half-mile off. And if you're navigating by satellite, watch out!

Measurements based on the atom are just part of the new NBS look during its war on the measurement pinch.

Take the simple question: how hot? At room temperatures, thermometers are fine—and the Bureau calibrates these regularly. But to get an accurate temperature at thousands and millions of degrees, your measurements, for one thing, have to be remote.

Light can do this, too. Unfortunately, present measurements at 15,000 degrees are only accurate to within 1000 degrees. At a million or more degrees, they are even more inaccurate.

Yet temperatures in the million-degree range are a must for inducing fusion for cheap atomic power. Uncertain temperature measurements are seriously hampering today's fusion research.

Rocket engineers, too, want to measure extremely high temperatures accurately. In one case, reduction of uncertainty from 10 degrees to 2 degrees F. resulted in a savings of 250 pounds in a missile, with an

increase in range or warhead size.

Help along this line is coming in a project that's been under way at NBS for some five years.

Take the rainbow, or color spectrum of light, and stretch it and in most cases you'll find it's made of thin lines of distinct colors and hues.

Now most "excited" atoms—and heating an atom is one way of exciting it—give off such fine lines of distinct color. And the nature of the lines can be used to estimate the temperature of the source.

Bureau physicists have been identifying which spectral lines belong to which atoms at which excitation states. And to appreciate the size of this job, all 92 natural elements are being looked at; the average chemical element has 15,000 possible lines.

Apparently far afield, too, is the Bureau's research with advanced electronic computers. But, as one computer scientist pointed out, "Computers are becoming more of the rule rather than the exception, a requirement rather than an option" in research.

Research with computers at NBS helps in the design of new mathematical tools for our new technology and also helps test reliability and life of computer parts—all aimed at more precision.

Much of the work the NBS scientists do with their computers is sponsored by other government agencies. Examples are mathe-

matical weather prediction for the Weather Bureau and population statistics for the Census Bureau (like NBS, both are arms of the Department of Commerce). NBS scientists have even used computers to automatically translate Russian for the Army (PM, December, 1960).

Another part of the NBS's new look to relieve the measurement pinch is its research in near-space. The primary purpose of this research—conducted mainly by its Boulder, Colo., lab—is to learn more about the ionosphere. This is the layer at the top of the atmosphere that bounces conventional radio waves back to earth or bends microwaves that flash out to space.

To measure the ionosphere's effects on radio waves, NBS has built a model missile-tracking set-up in the Colorado mountains and a giant 22-acre radar antenna (made of more than 9000 dipoles) in Peru. Also, a "Topside Sounder" satellite (to bounce radio waves off the top of the ionosphere) was due to be put into orbit in 1962.

The Boulder labs also have made a big step forward in precise measurement and control of frequencies. With the help of a cesium "clock," radio frequencies can be produced accurate to two parts in a billion. But Boulder scientists still are not satisfied. One points out: "For radio communications, the tracking of satellites, the control of long-range rockets and astronomical observations, timing accuracies of one part in a billion or better will be required."

Other lacks in radio measurement are still causing unnecessary expenses and some dangers.

At last year's aerospace industrial conference, a *Minuteman* missile maker declared:

"Each launching control center consists of an array of buried dipole antennas. The missiles themselves are also buried in silos. The control center radiates signals to several *Minuteman* launching sites at least 20 miles away."

Because of the frequencies used, each buried antenna is several hundred feet long. "The deeper the antenna is buried, the safer the system is from enemy attack," said the engineer. "However, the missiles will not be triggered if the radio field strength is too low and the entire system then becomes worthless."

Because engineers couldn't measure the sensitivity of the antennas accurately enough, they overdesigned them. The result: "This causes an increased cost in each installation of \$150,000. Multiply this figure by 45 installations and the increased cost goes into the millions."

There's also the problem of the shortcomings in measuring radio interference.



PHOTON-BEAM equipment was designed by NBS for studies in relatively new field of plasma physics

Unless you can measure accurately enough the radio signal that's blocking yours, you can't do anything about it.

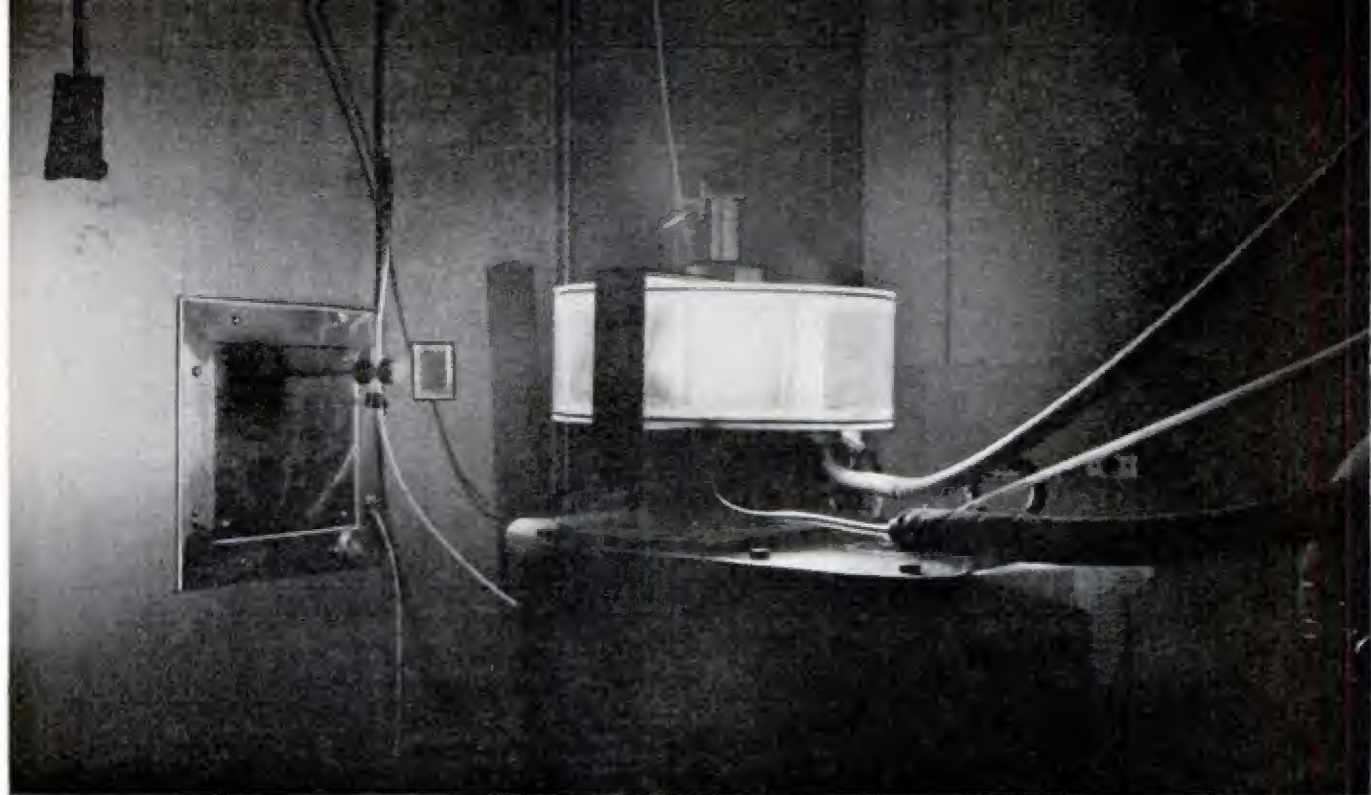
Another missile engineer told the conference, "Whenever a missile is prematurely detonated, it is probably due to radio interference. We read in the newspapers only that the missile failed. A future enemy will be the first to learn of your weakness regarding interference—for example, we could cite the lessons learned about radar jamming during World War II. There are some serious doubts in my mind that many missiles will ever be launched during the next war, because of electronic counter-measure activities."

Such problems as interference standards and measurements, while urgent enough, seldom come to public attention. But there was a dramatic instance when it did. The same engineer is talking:

"A certain Navy cruiser blanked out the 'Howdy Doody' television program by its radar in the New York area. When the 'Howdy Doody' program disappeared from the air, then everyone agreed that something must be done immediately.

"I think our program is far more serious than that, but it points out the need for greater interest in radio-frequency interference. When people discover that missile programs are being delayed due to radio interference, it may be too late. We need better interference measurements."

A similar eye-opener appeared in *Industrial Research* magazine earlier this year. Dr. W. Crawford Dunlap, director of semiconductor research at the Raytheon Corp.,



EXPLODING WIRE discharges eerie light. Cylindrical shock waves generated by this technique are being studied at National Bureau of Standards to provide high-temperature data for plasma and astrophysics

said modern miniature electronic parts were not so sophisticated as has been claimed. Virtually every case "is a mixture of science . . . and witchcraft."

As for the solid state materials—grains of which were supposed to replace every bulky vacuum tube—he says, "Preparation and purification methods still leave much to be desired. . . There is but hazy understanding of the imperfections and impurity states."

Establishing standards for measuring the impurities in such materials—which is what makes them usable as transistors—is another of the new programs of the NBS. It is a combined physics and chemistry problem. So, too, points out the bureau's associate director, William A. Wildhack, is research into more precise measurements of acidity, which would mean more precise control in chemical, drug, metal and food industries, more efficiency and less waste and, conceivably, better products and lower prices.

Also, points out Wildhack, medical research has felt the new measurement pinch. The ability to measure weak amounts of radiation first had to be acquired before pinpoint radiation of cancers were possible.

There's also the assaying of sodium and potassium in body fluids. This is important information for the physician whose patient is in shock, or out of surgery. It used to take a day to measure these. Sometimes a day was the difference between recovering and not. Now the test—thanks to new measurement techniques—takes 15 seconds.

Medical research benefits in a big way from the measurement problems solved for industry. More precise electronics can mean better electron microscopes used to study viruses and parts of living cells. And further measurement breakthroughs could push along efforts to make practical such devices as artificial pumps to replace faulty hearts and membranes to replace damaged kidneys.

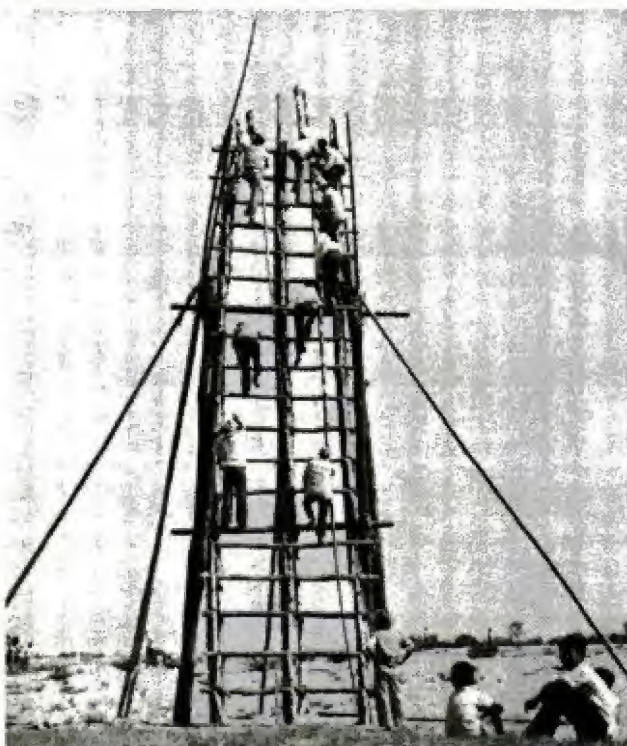
"It is no accident of history that measurement and technological progress seem to go hand-in-hand," said Dr. Allen V. Astin, NBS's director.

Symbolic of its move from steam-engine technology to that of the ballistic missile, NBS next year will start leaving its Washington, D.C., buildings—some of which date back to its founding in 1901—for new ones in Gaithersburg, Md., 20 miles away.

On the new 550-acre campus will be a million-pound deadweight machine for calibrating such devices as those that measure rocket thrust and missile load. The new machine will be more in line with today's rocket thrusts than is today's 111,000-pound one. It will also be more accurate: .005 percent vs. .02 percent.

At the Gaithersburg site, too, will be a complex of atomic-age equipment, including the world's most intense beam linear electron accelerator, a betatron, a synchrotron and a nuclear reactor.

Measurement, Dr. Astin said, is more than the language of science; it is "the means for applying research for the advancement of our general welfare." In short, we need a more accurate inch.



Rocket Shoot, Laos Style

Each spring, in spite of civil wars and other disturbances, the villagers of the tiny kingdom of Laos hold a rocket festival, called "Bang Phai." It's part of a rite to pray for rain and a good crop.

While spectators line the hillside to watch, others carry the long-tailed and often gaily colored rockets to the bamboo launch gantry. Then the countdown begins, in a figurative way.

It may last anywhere from a few seconds to several minutes, depending on how dependable the fusing is. And, like their big-brother missiles at Cape Canaveral on the other side of the world, sometimes the rockets fizzle on the pad.

No one seems to mind, however, because Bang Phai is a time of merry-making. Songs and dances accompany the rocket shoots, and sometimes one gets off the ground—as high as 200 feet.





Homemade 40-Footer

With no previous experience in boat building, businessman Ted Hill of Tacoma, Wash. decided to build a 40-foot fiberglass-hulled twin-screw cabin cruiser.

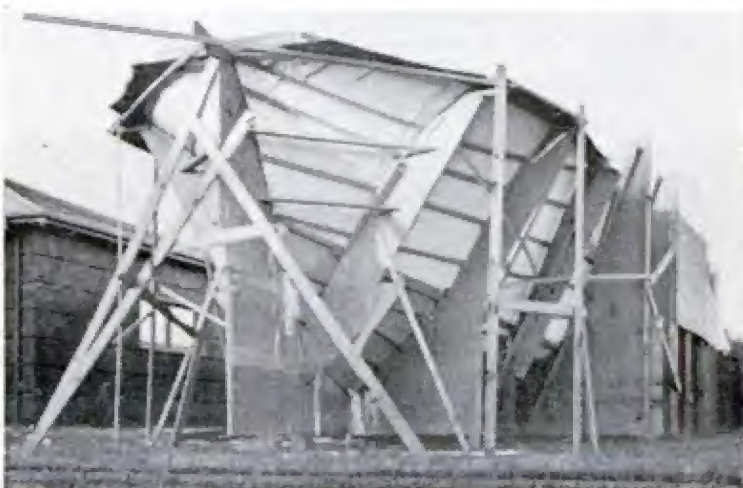
First, he found a picture of the boat he wanted and bought a set of the plans. The next step was to adapt the drawings, which were for a conventionally built wood-planked hull, to fiberglass construction. A fiberglass hull would involve less work if he could think of a practical way to make the mold, he figured.

Working from the plan's table of offsets, he cut light plywood frames for the mold and staked them up on level ground. Next, longitudinal battens were tacked across hull-section cutouts in these frames. Sheets of one-inch thick plastic foam were then nailed to the battens to develop the hull form. A touch of battle-ship flare was added to the bow.

To give the foam-plastic mold a smooth surface, a coat of molding plaster was applied with a squeegee, sanded and painted.

Checking with the designer verified that a $\frac{3}{4}$ inch-thick fiberglass hull would have strength equal to a wood-planked hull. After building the hull up to thickness, wooden deck beams were cemented in place with fiberglass gussets, then the mold framing and plastered-foam mold were stripped away. A mahogany cabin and engines finished the job.

Today, Ted Hill is skipper of one of the sleekest, least-expensive 40-foot cruisers on the waters of Puget Sound.





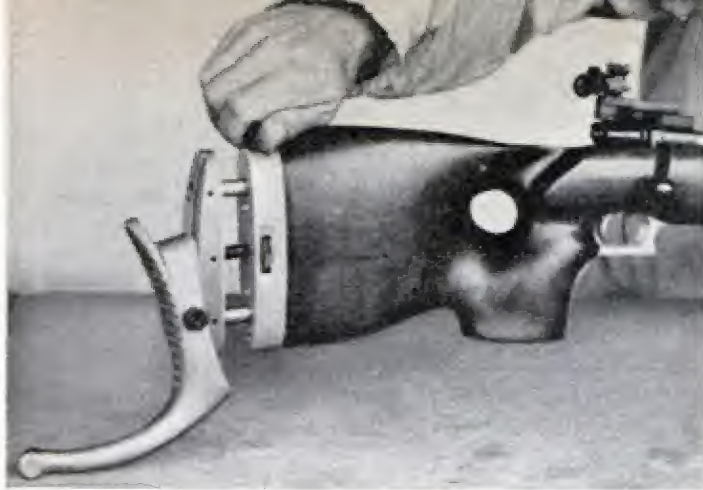
National Rifle Association photo
RUSSIAN FREE-RIFLE TEAM, firing .22s at the 36th World Championships in Caracas, Venezuela, shows typically "relaxed-but-tense" style in shooting booths



WORLD'S TOUGHEST TARGET SHOOT

By Ken Warner

PHOTOS BY THE AUTHOR



ADJUSTABLE-HOOK BUTT PLATE permits adjustment in any shooting position; saves shooter moving head



RIGHT-HAND POSITION on free rifle shows "saw-handle" pistol grip and double set triggers. Natural fit aids right hand's single task — squeezing trigger



LEFT ARM AND HAND, braced against left hip, hold entire weight of rifle in standing position. The adjustable palm rest gives less fatigue, better control

Lifting a total of three tons to his shoulder during a match, the free-rifle marksman must be good enough to hit a bull's-eye the size of a coffee cup over 300 yards away. Perhaps the world's most demanding sport, free-rifle shooting was America's weak spot in International competition — until we produced a champion this year

WHEN THE SMOKE CLEARED at Cairo, Egypt, in mid-October, Gary Anderson, shooting for the U. S., emerged from the World Shooting Championships toting not only a free-rifle championship but a brand-new record to boot.

In small-bore competition, he scored 1157 out of a possible 1200 points — breaking a Russian-held world mark.

Anderson's performance is a happy reversal of form for this "nation of riflemen" which, since 1930, hasn't been able to bring home the drumsticks from an international turkey-shoot. Almost everyone else who competes—the Swiss, Swedes, Finns, Hungarians, Germans and especially the Russians—has been out-shooting us time after

time. If Cairo is any indication, things may start going our way. (See *Items from All Outdoors*, this issue, for the scores.)

If numbers were shooting scores, we'd have been winning all along, for we're still a nation of gun-toters, hunters and shooters. We sell over 12 million hunting licenses a year; the National Rifle Association has 460,000 members, 130,000 of whom are registered competitors; there are 4800 senior and 5500 junior rifle clubs, and 2100 registered matches were held last year.

But for the great mass of competitive shooters, the style is strictly our own, and it's too easy for International competition. Furthermore, it's based on military needs, not competitive sporting needs.

Most of us are still shooting for sport on targets developed 60 years ago to train run-of-the-mill recruits with untuned military rifles. We use a 12-inch bull's-eye at 200 and 300 yards, and a 20-inch bull at 500 and 600 yards—easy marks by European standards.

In International Shooters Union (ISU) shooting, they use a 3.93-inch bull's-eye at 300 meters (330 yards). On their 50-meter target for .22 rifles, the center ring is just half an inch across. In 64 years of competition, nobody has shot a perfect score. With our existing equipment, experts doubt that anyone ever will.

The targets, the ranges, the equipment and the people in free-rifle shooting are fascinating. They add up to the most diffi-

cult shooting there is, and our past weakness at that division points up the reasons for our lean years in International competition. Let's take a look at free-rifle shooting.

The rifle is "free" in the sense that there are few real restrictions on either the rifle or the shooter. The only limits—aside from a mess of regulations designed to keep competitors from resting the rifle on anything but themselves—are three: The rifle must be a center-fire caliber up to 8mm. (except for the .22 for 50-meter work) the weight must be under 8 kilograms (17.4 pounds) and the sights may not use glass—no optical sights. The only external difference between a 300-meter rifle and a 50-meter rifle is the size of the hole in the barrel.

The target at 300 meters has a 10-centimeter 10-ring. The 50-meter target for .22s is simply a scaled down 300-meter mark. Its 10-ring is almost precisely half an inch across.

This means the 300-meter shooter is aiming at a mark the size of a coffee cup sitting $3\frac{1}{3}$ football fields away! The 50-meter shooter is shooting at less than a dime, which measures $7/10$ of an inch, at 55 yards.

The standard position match calls for not 10, not 20 shots, as most U.S. matches do, but for 120 shots at this size target. And it also requires that the shooter use three different positions—prone, kneeling and stand-



ISU's THREE POSITIONS

1. STANDING position is toughest, though a good free-rifle shooter is as steady standing as an ordinary sporting rifleman is with a rest. "Straight up" position here is near perfect. Note tall spotting scope

2. PRONE position. Note drawn-up right leg, to free abdomen and make breathing easier. Very low position—rifle is only six inches above ground—adds to steadiness over long (40-shot) course

3. KNEELING position, with small cushion under right ankle for comfort and stability. Shooter is Captain Daniel Puckel, one of the best free-rifle shots in the U.S. He tied world record during this practice round.



ing—shooting 40 shots in each position.

How good can the International people be? Well, they're getting better all the time. Over the past 34 years, they've jacked the record up a bit at a time. At 10 points per shot, 120 shots adds up to 1200 points.

World records now are 1149 and 1157 (Anderson's score). In 1928, 114 was tops. Even in 1994, it still won't be 1200. Most of that gain in 32 years has been made scientifically by improving the men.

Most of this progress has been made in other countries. The scientific treatise that is the "bible" of free-rifle shooting was written by a Russian. Titled "Sptivnaya Strel'ba Iz Vintovki" (which means "Competitive Marksmanship with the Rifle and Carbine") it was written by one A. A. Yur-yev. Yur-yev's book is so good that the U.S. has translations for its shooters. Graphing the heart beat, for example, told Yur-yev and then all free-rifle shooters that they should shoot fairly quickly. His graphs said the heart took 4 seconds to slow down after the exertion of lifting the rifle to the shoulder, then it runs smoothly for 6 to 7 seconds, and then gets ragged due to fatigue.

Science was one of the factors that has left the Russians holding every existing team record with the free rifle. The other was time—time for the individuals to spend learning, practicing, shooting. In Russia, of course, a top athlete may earn his living

at being an athlete and still remain, for the purposes of international competition, an amateur.

And in the U.S., too, our chief hopes for International shooting wins lie with men whose business is to shoot—the men in our armed services' special marksmanship units.

It started in 1956, when the Army organized the U. S. Army Advanced Marksmanship Unit. Although the name was changed this year to Marksmanship Training Unit, the mission hasn't changed any. The MTU's first job is to train marksmanship instructors. Its secondary job is to train shooters to represent the Army in any and all shooting competitions, and these most definitely include those competitions that are held to select International shooting teams.

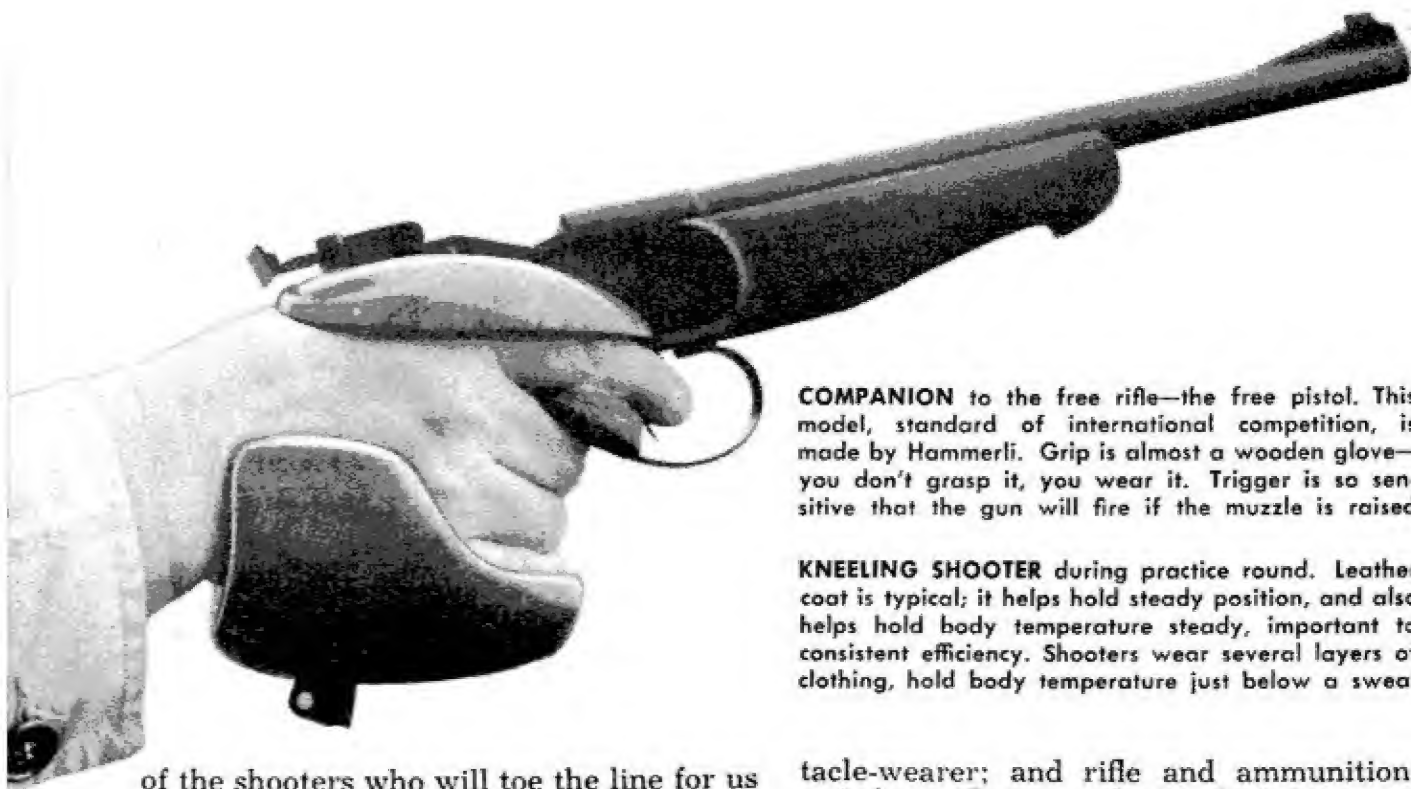
The MTU is at Ft. Benning, Ga. It is equipped and staffed to support its teams of shooters completely. There are gunsmiths and a shop good enough to build rifles from scratch, there are supply rooms stacked with rifles and handguns, there are ammunition bunkers full of match-grade ammunition. When the available ammunition isn't good enough, the MTU builds its own.

The MTU's shooters are our best. The other services have good men in their special outfits, but not so many of them. There are top-level civilians, too. But the majority



FULL KIT for free rifle includes .22 and big-bore rifles and accessories, leather coats (one for prone shooting) and ski-type boots for the kneeling position





COMPANION to the free rifle—the free pistol. This model, standard of international competition, is made by Hammerli. Grip is almost a wooden glove—you don't grasp it, you wear it. Trigger is so sensitive that the gun will fire if the muzzle is raised

KNEELING SHOOTER during practice round. Leather coat is typical; it helps hold steady position, and also helps hold body temperature steady, important to consistent efficiency. Shooters wear several layers of clothing, hold body temperature just below a sweat

of the shooters who will toe the line for us at world shoots will be MTU people.

In 1958, MTU men were on the team we sent to Moscow. They scored no significant wins. A pistol-shooting Marine captain did bring home one gold medal.

The next year, 1959, was a bell-ringer. MTU shooters cleaned the boards at the Pan-American Games in Chicago. The whole Western Hemisphere was there. The Russians were not.

The Olympic Games in 1960 were disappointing. In Rome, with the world on hand, our team scored nicely, but was no winner. That same Marine captain with his pistol brought home our only gold medal.

Here are some of the things that make the contest the world's toughest shooting game:

A free-rifle shooter lifts, in a match, about three tons just getting the rifle up to his shoulder. To get those shots off just right, he'll suspend his breathing for a total period of 50 to 75 minutes—enough so that he must take special care not to suffer from oxygen starvation. In a big match, he'll lose six to eight pounds.

The free-rifle position match is a test of shooting skill and nothing else. Each shooter gets a sheltered shooting space; he is furnished with standard mats and pads; he gets 6½ hours to shoot his 120-shot string. In fact, he is allowed to determine for himself in which order he will fire his positions.

A kit for a free rifleman fills half a jeep. There are shooting coats of leather, gloves, spotting scope, special boots for the kneeling position if he wishes; there are special adjustable shooting glasses for the spec-

tacle-wearer; and rifle and ammunition.

A free rifle is not the kind of thing you select for stalking squirrels. It looks rather like a marriage between a 2 by 8 and a long gas pipe. The result is a big bolt-action single-shot musket with a barrel about an inch in diameter and about 28 inches long. The stock is angular in general form, with a loglike forearm, a pistol grip like an automatic handgun, a thumbhole in the butt-stock and an elaborate butt plate.

Any gadget that will help the scores is hung on the free rifle. The butt plate adjusts for length several inches, and permits the use of an under-the-arm hook in kneeling and standing positions and a rubber cushion for prone. A palm rest locks into the forearm to extend the shooter's arm and help him balance the rifle. A sling hooks in, too, for use in kneeling and prone.

Aside from the barrel's accuracy, the two mechanically marvelous items in the inventory of a free rifle are the sights and the trigger. The sights are often adjusted between every shot, as conditions change, so they must be rugged. At the same time, they have to move the bullet strike as little as an eighth of an inch at the target and do it the same way every time.

The trigger is all-important. The reason for this becomes apparent when you see free riflers in practice. They work that trigger pretty hard. In getting ready for a match, a shooter may work his trigger 25,000 times. And he can't use it if it changes its character at all.

The trigger must be delicate, too. If it's a set-trigger, it has to adjust down to a one-ounce pressure, and show no movement when pressed to turn the shot loose.



Because of the difficulty with set-triggers, some MTU men use regular single-stage triggers, such as are found on good sporting rifles.

That lack of movement at the time of discharge is important to the shooters. It's so important that they'll use a three-pound trigger that doesn't move in preference to a one-ounce trigger with a little creep.

And above all this, there's the rifle. It must consistently shoot into 10-shot groups smaller than the 10-ring. That means half an inch at 50 meters; about three and a half at 300 meters. Such performance is almost incredible by normal standards, but free rifles do it all the time.

Naturally, such firearms are expensive.

Before last year, he who wished to play with the big boys in this sport had to go where they got their rifles—to Europe. Now, Remington offers a free rifle, and a pretty good one, for a mere \$361.05, which isn't much, considering that a really good hunting rifle can push \$200. Winchester is reported ready with a free rifle, too.

For a 50-meter rifle, those who don't want to pay Remington \$361.05 (which buys either kind) can get an Anschütz for about \$240. This is good enough for the MTU, so it ought to be a fair shooting iron.

Ammunition is another big factor. For the 300-meter rifle, the only course is handloads, very careful handloads. That's what the MTU uses. For the 50-meter rifle, our own standard brands of match ammunition at \$1.25 per 50 are good enough. They are so good, in fact, that the foreign factories use them to test rifles.

The MTU, because it has many rifles,

buys many lots of ammunition and matches it to the guns in test firings. They get pretty good matches—the goal is .33-inch groups in test barrels and .4-inch groups in match rifles at 50 meters. The 300-meter rifles must shoot to a three-inch standard, which, strangely, is easier than the 50-meter goal.

So much for the technical side of free-rifle shooting. It is expensive and it is difficult to learn the tricks that make the guns perform. That's part of the problem. The rest is in the shooting, and in the shooters. Our team win record has been bad for two reasons: We haven't fully learned how yet and there isn't enough competition at home to push the men to their limits.

The shooters at the MTU and other ISU aspirants around the country cry for competition. "One match is worth two weeks of practice," they say.

It is a little demoralizing. The free-rifle shooters are dedicated shooters—like any top athletes, they eat, sleep and breathe their sport. They practice hard—every day—even though they need competition worse than practice. Once a man like MTU's Capt. Daniel B. Puckel is shooting scores like 1153 in practice, what he needs is competition, not more practice.

The NRA has just made available a reduced 50-meter target for use on 50-yard and 25-yard ranges. This is one step. The next is to encourage young shooters to go the ISU route.

Despite the problems, we've made heartening progress in this tough sport; the team we sent to Cairo in October was the best we've ever had in ISU competition.

★★★



Hot-Cold Electric Motor

Operating continuously, a specially insulated electric motor can be plunged from a temperature of 320 degrees below zero into an oven and baked to red heat at temperatures above 1100 degrees F.

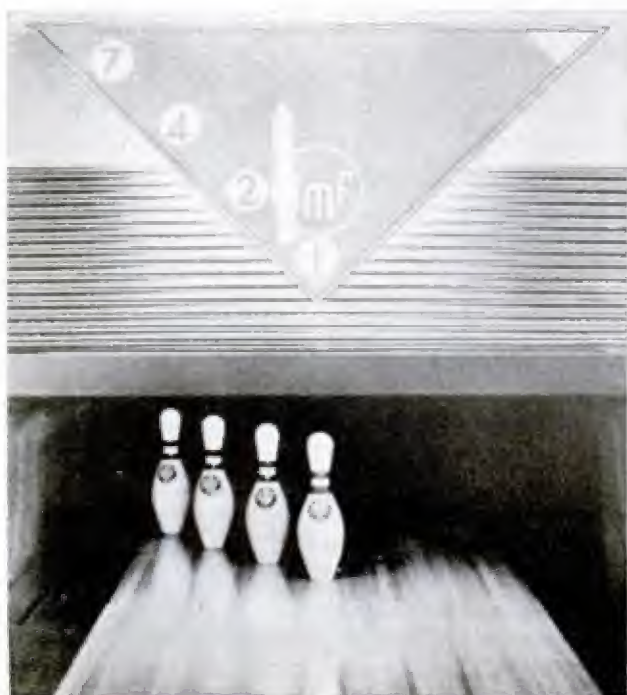
The insulation system, developed for use in space by Westinghouse, is inorganic, being composed of ceramic-type materials.



Rough Landing

Pigeons are prevented from perching on ledges and window sills by an aluminum bird chaser that can be attached with adhesive or metal straps. Two rows of blunt spikes set at angles discourage birds from settling, but do not cause injury.

The maker is G. A. Harvey and Co. Ltd., Woolwich Rd., London SE 7, England.



Pin Setter Shows Where to Aim

Bowling duffers are now told where to aim the ball on a new pin setter, taking all the guesswork out of making spares.

After it sweeps away the pins that have been knocked down on the first roll, the pin setter shows on its lighted board which pins are still standing and marks the spot the bowler should aim to knock them down.

Called the Sparemaker by the manufacturer, AMF Pinspotters, Inc., the indicator works for any spare combination—all 1023 of them—including the splits. It even indicates when the ball should be thrown at an angle.

AMF, which also introduced the lighted board, or Pindicator, cautions—with tongue in cheek—that the Sparemaker only shows the bowler where to aim the ball. The bowler still has to throw it. It also makes no guarantee on splits.



Trap Shooting for Archers

Moving targets for bow-and-arrow sharpshooters are 15-inch clay pigeons that simulate the body of a bird. They are thrown into the air by a special trap or by hand.

A raised center, seven inches in diameter, adds a three-dimensional effect to the target. The target simulates a pheasant in size and flying characteristics. The Bow Bird is made by the Saunders Archery Target Co. of Columbus, Neb.

Drip-Dry Inflatable Hanger

Faster drying of synthetic fabric shirts, sweaters and blouses without rust stains or creases is possible with a new, inflatable hanger. The plastic hanger can also be used to retain the correct shoulder form of garments while they're not being worn.

For traveling, it can be deflated to fold compactly into a small package. The hanger costs \$1.10 and comes in white, yellow, pink, blue or green.

It's available from Artan's Buying Service, 158 Shelly Dr., Claymont, Del.

● All penguins do not live in regions of ice and snow. Some species inhabit the east and west coasts of South America, the shores of South Africa, areas of Australia, New Zealand and Pacific islands. No penguins live north of the equator.



Portable Fluorescent Light

Beaming for 15 hours on power supplied by ordinary flashlight batteries, a new, portable fluorescent lamp gives light equivalent to that of an ordinary 50-watt incandescent bulb.

The lamp weighs 7½ pounds, is 18 inches high and is contained in a plastic case. The fluorescent tube is good for 7500 hours. Developed by International Telephone and Telegraph Corp., it sells for about \$55.





Wind-Driven Water Craft

Two propellers, one above the waterline and the other below it, combine to propel a unique water craft than can travel *into* the wind that powers it.

The large above-water propeller, powered by the wind, is geared to the small below-water prop, which in turn furnishes the thrust.

Built in the form of a catamaran to avoid unnecessary keel structure and to distribute buoyancy, the craft can be propelled into the wind because the thrust is below water.

The maker, John S. LeLacheur of Chester, Pa., plans to build a man-carrying version. The small prototype has been clocked at 5 m.p.h. into a 25 m.p.h. wind. The large version could be used for sport.

Rubber Mats for Playgrounds

Put together like a puzzle, a rubber mat can be created to cover any dimension and provide a bouncy floor cushion for playgrounds. Manufacturer is Mitchell Rubber Products, Box 65587, Glassell Park Sta., Los Angeles, Calif.

Experimental Winged Hull



Two skis in front and a conventional outboard motor behind are all that touch the water when a boat with a 16-foot wing gets under way.

The experimental "winged hull" is being tested by Lockheed-California Co., a division of Lockheed Aircraft Corp. It has reached a speed of 45 knots and may be a prototype of much larger winged boats that will travel entirely free of the water, crossing oceans and reducing cargo costs per ton mile.



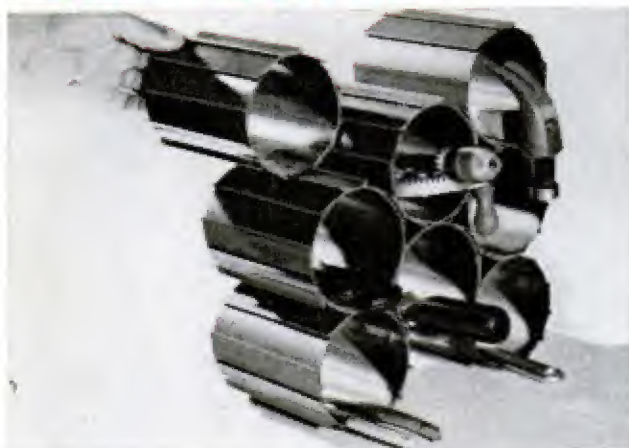
Is This the World's Tallest Structure?

Well, it's in Missouri, so you'll have to "show me."

Anyway, the natives claim the new television tower near Cape Girardeau is the world's highest man-made structure. It's 1676 feet tall, more than 200 feet higher than the mast on top of the Empire State Building. Built for KFVS-TV, it beams programs to a six-state area. Eighteen guy cables help support the triangular tower.



WHAT'S NEW FOR Your Home



COLORFUL INTERLOCKING TUBES provide expandable storage space for kitchen utensils, tools, beverages. Set of 12 plastic tubes: \$6. Also in aluminum. Made by Add-A-Comb, Inc., Box 1114, Weston, Conn.



FOOD GRINDER lets baby enjoy table foods with the rest of the family. Made of molded nylon, the grinder is easy to wash and sterilize. It can also be used to puree food for aged or ill members of the family. Made by Van Enterprises, Box 414, Waynesboro, Pa., it costs \$4.25 and comes in pink or blue



NONSTICK BROILER-FRY PAN fries, broils, roasts and bakes without fat. Nonstick surface penetrates metal and lasts for appliance's lifetime. Pan is completely immersible in water. \$40, Westinghouse



HANDY TUBE HOLDER can be used for toothpaste, cosmetics, shave cream or drugs. It makes one-handed dispensing easier, helps stop waste, and can be used to stand tube in upright position. Holder sells for 59 cents. The manufacturer is the Teem Company, 243 W. Fox Dale Rd., Milwaukee 17, Wis.



PERSONAL TV SPEAKER permits television watching at any hour without disturbing others. The speaker carries the sound of the 19-inch TV set only to the ear of the person using it. The speaker may be held by the listener or placed on the pillow or chair-back. The viewer may also change channels and turn the TV set on or off via the remote control in the case. It's made by General Electric Co., Syracuse, N. Y.



CLEANING LIQUIDS, SOAPS, POWDERS, are hidden, yet within easy reach in an aluminum tray that attaches to left or right-hand cabinet doors. The containers will not spill when door is slammed. Tray costs \$3.50, with attaching screws; maker is Better Home Products, 285 N.W. Ninth St., Boca Raton, Fla.



REVOLVING KITCHEN-UTENSIL HOLDER includes potato masher, deep ladle, turner, two-line fork, basting spoon and icing spatula. The tools are stainless steel with dishwasher-proof bakelite handles. Sets are priced from \$14.95 to \$16.95 and are made by Ekco Products Co., 1949 N. Cicero Ave., Chicago, Ill.



X166

SHOP AND CRAFTS

FLIP-OVER CHESS SET

On the wall it's a decorator shadow box for displaying a prized chess set. Off the wall the box serves as a fancy inlaid playing board. Slide-in locking feature prevents removal of chessmen on display

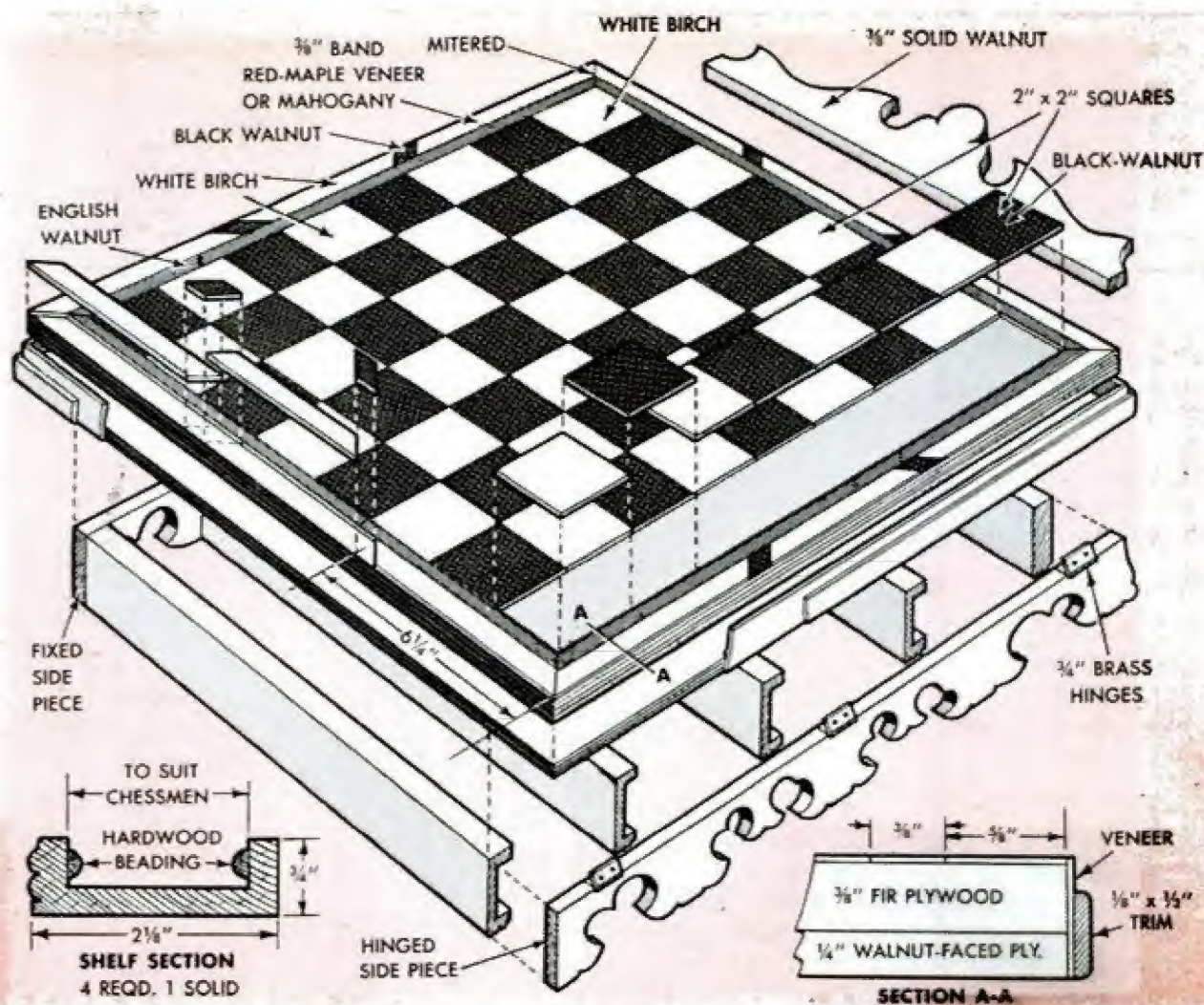
By Howard Whitecotton

AS DECORATIVE as it is useful, this novel wall rack not only provides for visible storage of your favorite chess set, but when removed from the wall and laid face down it becomes an attractive playing board. The design permits easy removal of the chessmen, yet prevents their toppling from the shelves when the rack is taken down for play.

In the chess set illustrated here, the king measures $4\frac{5}{8}$ in. high and has a $1\frac{1}{2}$ in. diameter base. The pawns are $3\frac{1}{8}$ in. high and have a $1\frac{3}{16}$ in. diameter base. These dimensions control the over-all size of the rack shown, and if they differ from the di-

mensions of your chessmen, the rack will have to be altered accordingly. As is evident in the drawings, the grooved rims of the chessmen's bases slide over hardwood beading on the shelves, which holds the chessmen in place even if the rack is turned upside down when removing it from the wall.

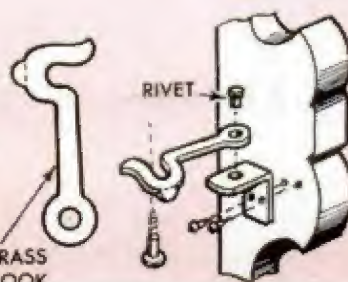
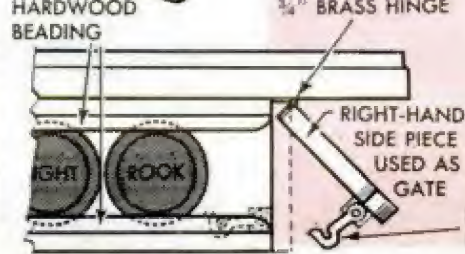
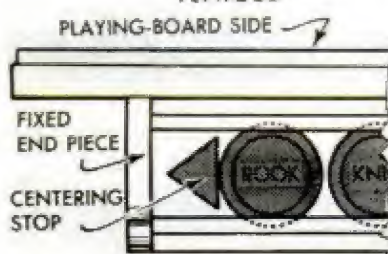
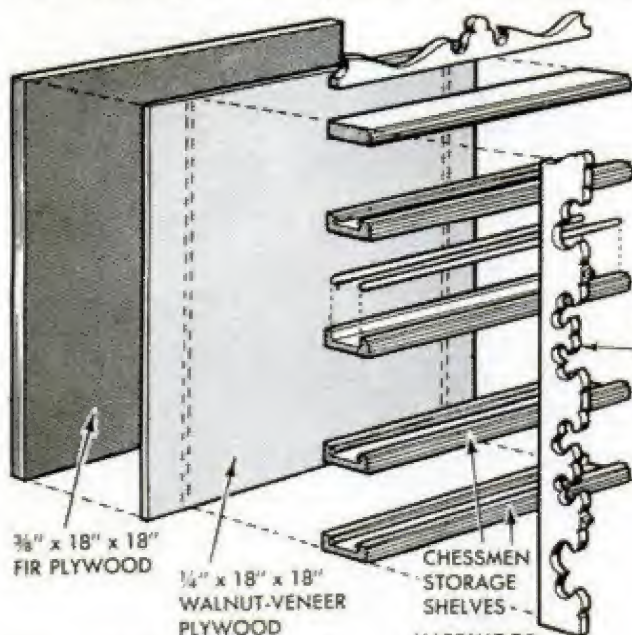
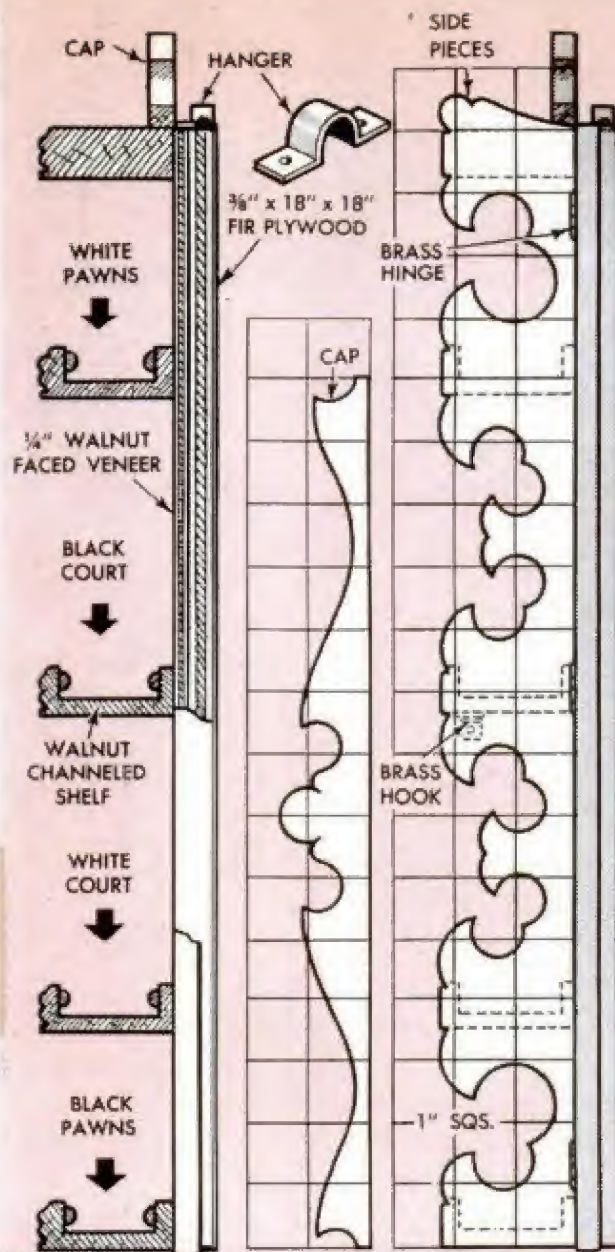
For the playing squares, 2 in. was selected as a good size, since the dark and light hardwood veneers come in strips $2\frac{1}{8}$ in. wide by 8 in. long. Black walnut and white-birch veneers were used in the rack shown. Some brands of veneer are precoated with a dried contact cement, but for a better

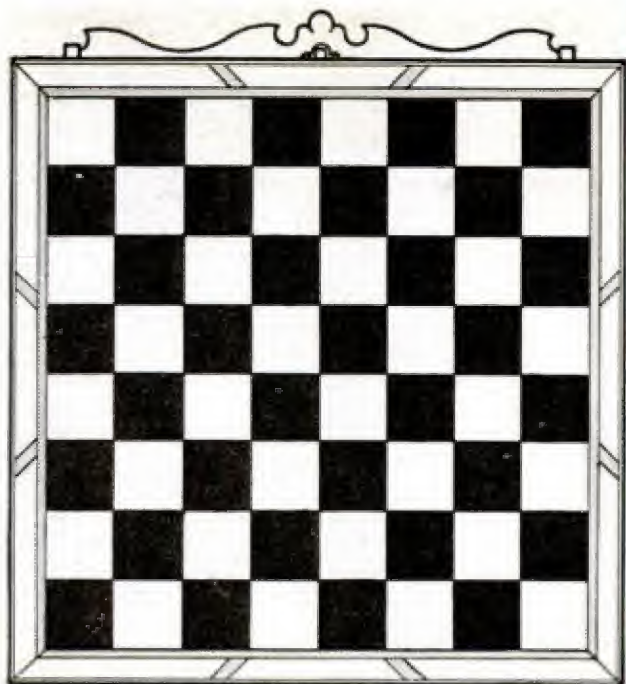


bond remove this coating with a solvent and use fresh contact cement in its place. Be sure to fill the pores of the wood with paste filler before the squares are set in place. Otherwise, the dark filler would be likely to stain the light wood, marring its beauty.

The base board is made from $\frac{3}{8}$ or $\frac{1}{2}$ in. fir plywood and faced on the front with a second panel of $\frac{1}{4}$ in. walnut-faced plywood. The playing field is eight squares wide. Adding 1 in. all around for a border gives an over-all size of 18 in. Square the plywood up on the saw, leaving the edges unsanded. Draw a fine line across the exact center of the board, both ways, on the fir-plywood side. Then coat this surface with a liberal amount of contact cement. Coat the unfilled side of the veneer squares too. Let the cement dry until it is not the least bit tacky to the touch.

Clamp a steel straightedge along one of the division lines on the plywood side and start laying a row of squares against the straightedge. Use a piece of waxed paper as a separator between the cement-coated plywood and the veneer squares. As each square is jockeyed into place, slip the waxed paper out slowly from under it and proceed to the next square. When the row is completed, re-clamp the straight edge along the other divisional line and continue as before. These two rows of squares form the base lines and the rest of the squares are merely laid against the adjoining





squares. The border veneers should fit snugly against the outer rows of squares.

After the border is completed, cement a strip of veneer along the raw edge of the plywood. Use a household pressing iron to weight the squares. If there are any cracks between the squares after a light sanding, fill with a neutral-tone filler. If the grains of both birch and walnut squares are laid in the same direction, the final sanding will not prove a problem.

Walnut was used for the original shelf because it contrasted well with the chess set shown. Maple might be more appropriate for use with a more modern chess set. The channel in the shelves is best routed out with a straight knife in a molding head, although a dado cutter also can be used. Note that the pawns take a narrower channel than the other pieces. If a shaper is not available, ready-made molding may be glued to the front edges of the shelves. Except for the contact cement used with the veneers, white glue is used throughout. No nails or screws are necessary. Be sure to allow enough clearance so that the chessmen may slide in and out easily, clearing the shelf above. Use $\frac{3}{8}$ in. solid walnut for the scroll-cut sidepieces and cap. Note that one side piece is hinged to serve as a door for removing the chessmen.

Pre-drill holes for the small brass hinge screws or they may twist off in the hardwood. The same applies to the small brass hook assembly shown in the drawing. After a final sanding, spray the rack with three coats of lacquer, rubbing between coats with 000 paper. After the final coat, finish with 000 steel wool and paraffin oil. You'll have a beautiful display case for your chessman, plus a board. ★ ★ ★

DECEMBER 1962



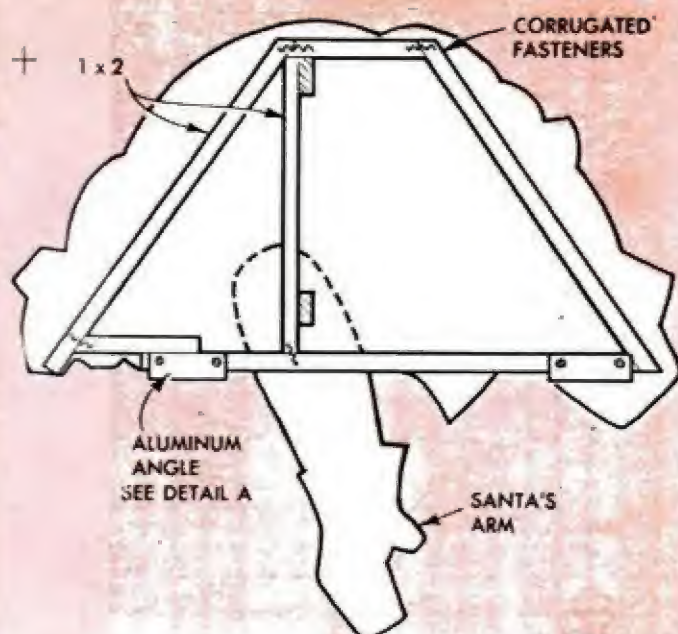
Planing Stop

This planing stop drops flush with the bench top when not in use. It consists of a hardwood strip 6 in. long and about $\frac{5}{8}$ -in. wider than the thickness of the bench top. Slot the piece as in the detail and attach it to the bench top with hanger bolts and wingnuts.—F. Krucker

Sure Kill

To get rid of sprouts from the root systems of trees that have been cut, snip off the sprout about 2 in. above ground, fill a No. 2 tin can about half full of rock salt and invert over the sprout. Drive the can into the ground to anchor it and then punch several holes in the bottom to admit moisture.—W. C. Wilhite





CHRISTMAS CUTOUTS—1962

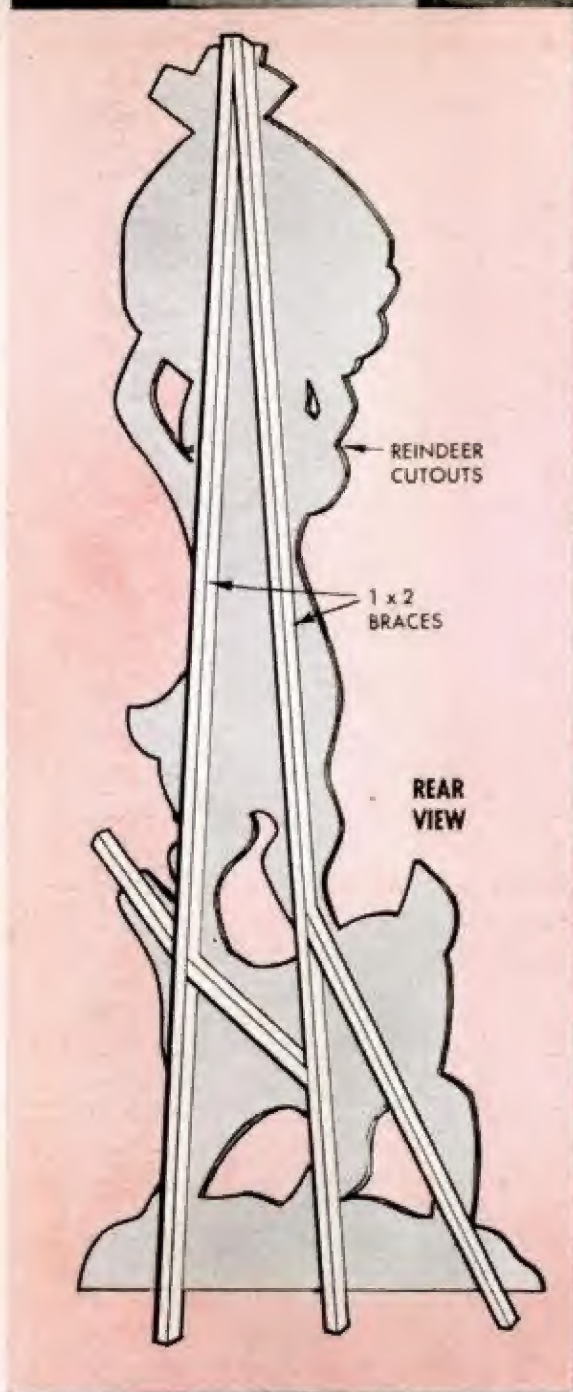
Using PM's new Project-a-Plan "transparencies" you can enlarge cutout patterns to full size in minutes with your 35-mm slide projector. Here they're presented for the first time, along with new ideas for saying Merry Christmas to passersby

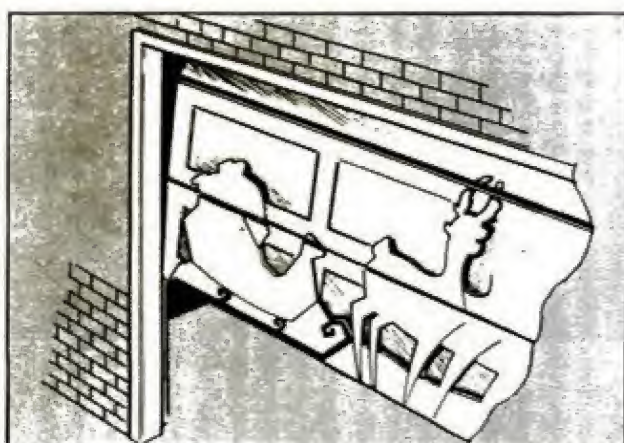
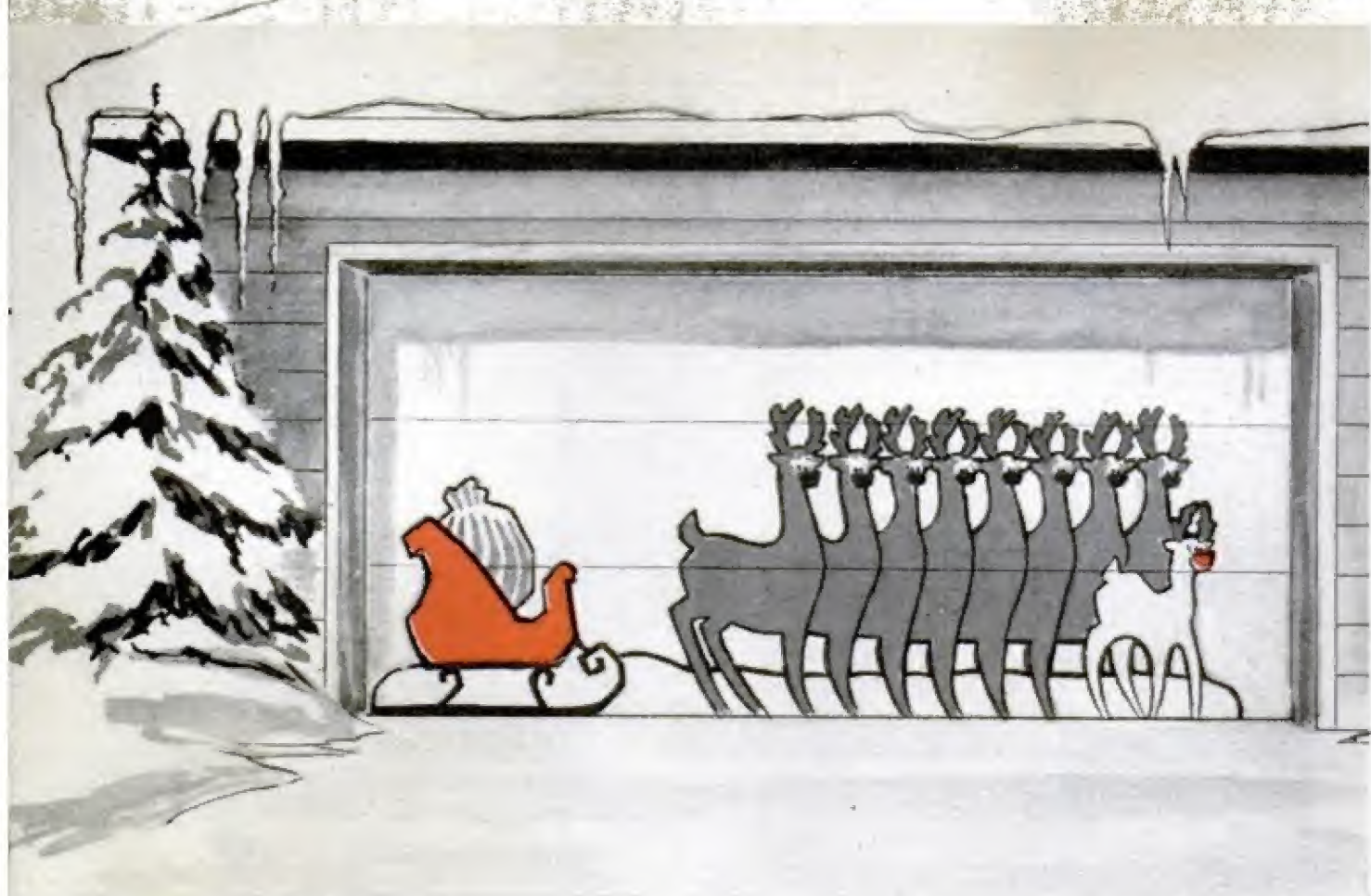
By David M. Swartwout

THIS YEAR SANTA comes in—of all things!—a space-capsule cutout, along with those traditional cutouts he's always approved for use during the Christmas Season. But, as you'll see, some of the cutouts cast Old Santa and his reindeer in new roles, and there's something else that's new. PM's Project-a-Plan lets your slide pro-

jector serve as your draftsman, and eliminates the tedious job of enlarging magazine patterns by the grid method.

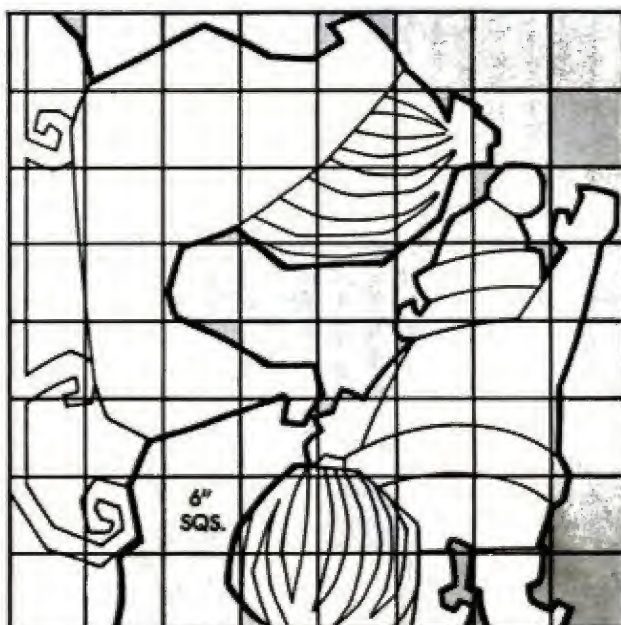
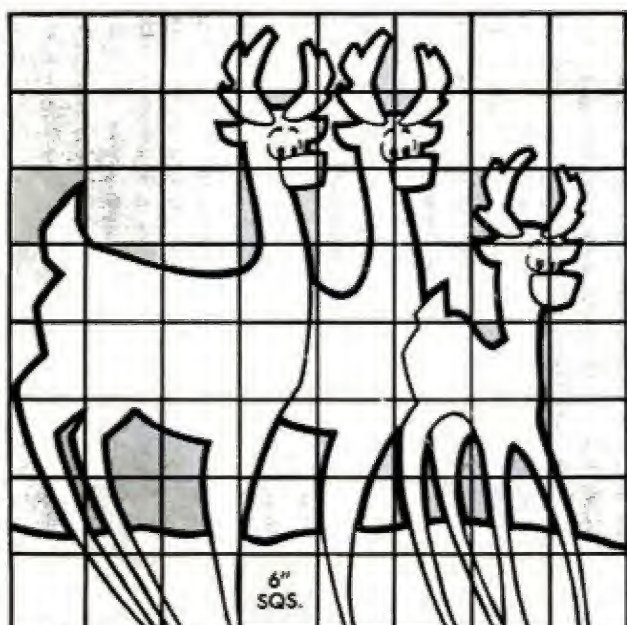
Here's how it works: clip any one of the paper "transparencies" on page 133, coat both sides with clear nail polish and insert between glass in a 35-mm mount. Then drop into your projector and blow up the





tiny pattern to the size you want directly onto your plywood or white-primed hard-board. When you get the size right, by moving the projector nearer or farther away, trace around the outline of the image with a heavy pencil and there's your pattern, ready for cutting out with a portable saber saw or keyhole saw. It's as simple as that.

On the other hand, if a projector is not available, you can enlarge the patterns in the conventional manner by ruling off the required area in squares of the size called for on a piece of tracing paper or medium-





- CUT -



- CUT -



- CUT -



- CUT -

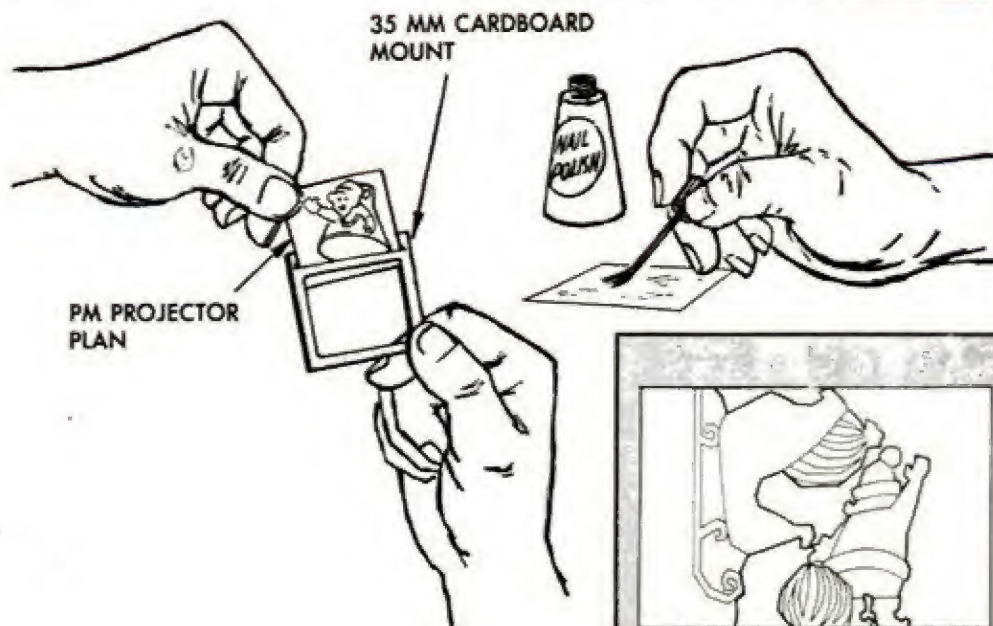


- CUT -



How To Use PM's Project-a-Plans

The paper "transparencies" along the right-hand side of the page are designed to fit a standard 35-mm slide mount when cut apart on the dotted lines. Before inserting them in the mount, coat each side with clear finger-nail polish or shellac to make them more transparent. If your slide projector is not air cooled, it is best to insert the paper transparency between glass when inserting in the mount. You have a choice of projecting the patterns full size directly on your panel or on paper thumbtacked to the wall. Some of the patterns require the use of two transparencies to project the complete pattern. Simply trace the projected outline. Simply align one with the other without disturbing the projector setup



PM PROJECTOR PLAN

35 MM CARDBOARD MOUNT

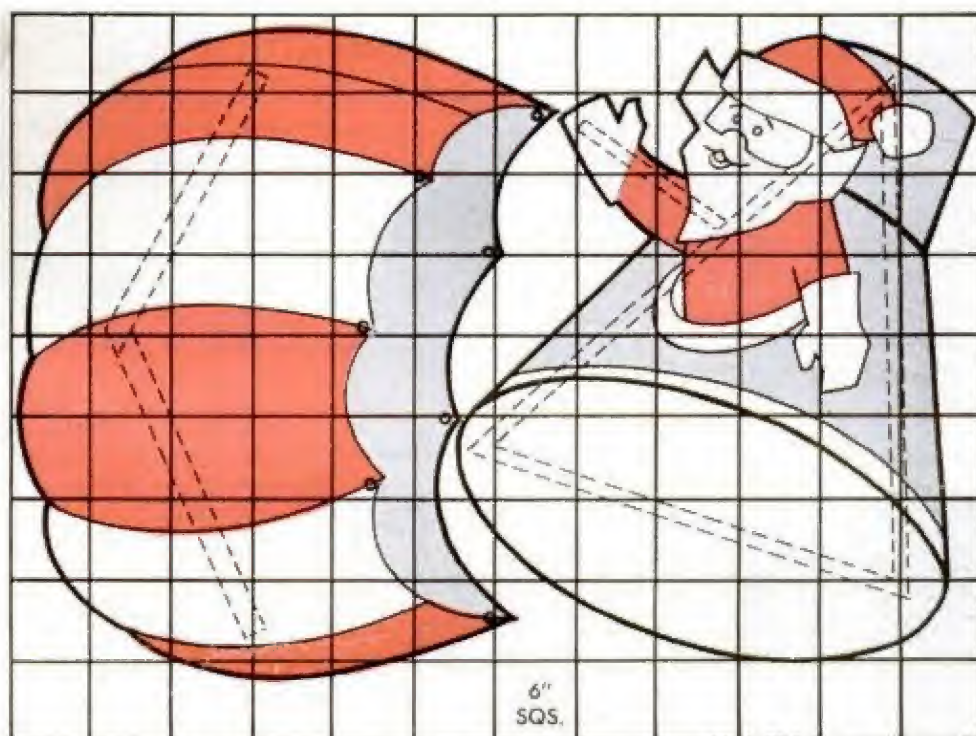
SEE REVERSE

SIDE OF PAGE



FOR CLIP-OUT

PROJECT-A-PLANS



FOR ENLARGING

heavy, wrapping paper. Wherever the pattern line is indicated as crossing the border-line of a square, pencil a dot. When the pattern lines are all dotted-in, draw the curved lines through the dots and you've got the full-size pattern on paper. Next, run over the pattern lines with a dress maker's perforating wheel, then place the paper on the plywood or hardboard panel and tape it in place.

Partially fill an old sock with talcum—use dry lampblack on plywood—and pat it along the perforated lines to transfer the pattern to the hardboard. Lift the paper carefully and there's your pattern outline. Be careful not to smudge it. Or if you prefer, use carbon paper to transfer the lines. Cut the parts to size with your saber saw and sand the cut edges smooth.

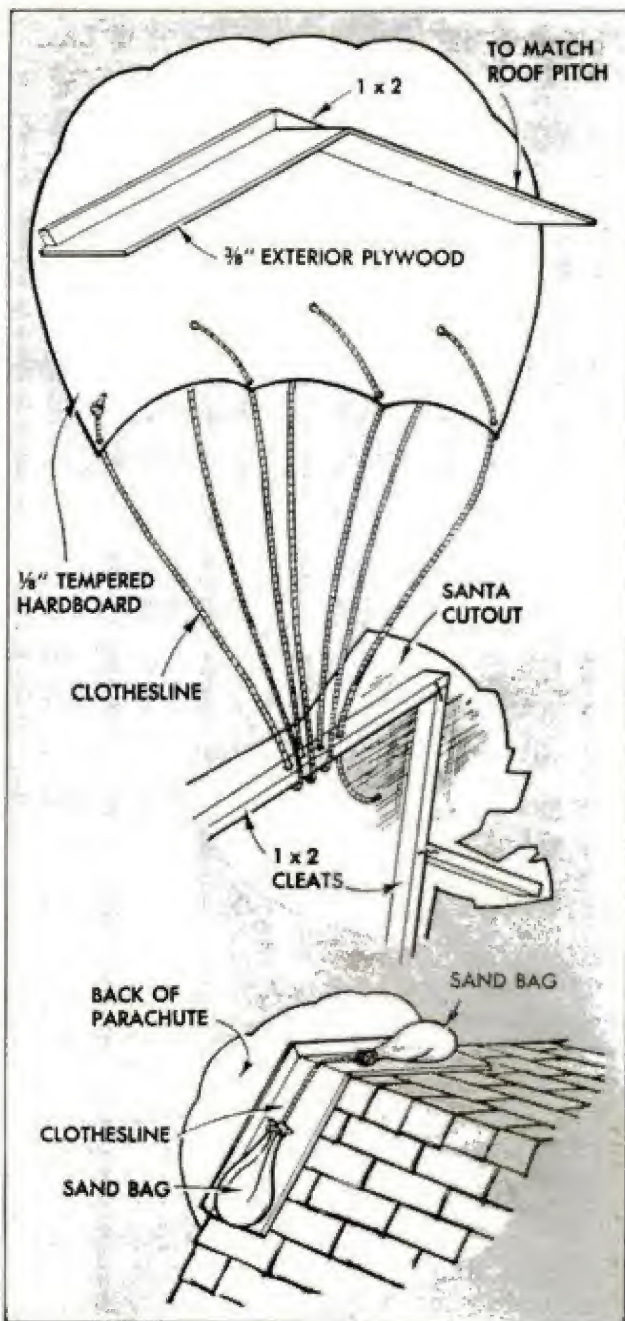
Coat all the parts, including the edges, with a flat-white undercoater applied with a paint roller. When this is thoroughly dry apply the finish colors, using an outdoor enamel. You'll need red and black enamels as well as white for most of the projects. For Santa's ruddy face mix a small quantity of red and white to make pink. A small quantity of black and white makes a good gray for the reindeer horns, and for the reindeer body mix red and black and lighten with white. After these coats have dried, outline certain areas in black as indicated on the patterns. Where the cutouts are to be located outdoors, it's a good idea to paint the backs as well. This is not necessary with the Nativity Scene and the Wise-Men cutouts which are set up indoors.

Going through the construction and mounting details you'll see how the cutouts are set up and how they are braced. Use brackets cut from aluminum angles and be sure to attach the brackets with aluminum nails or screws. Note especially the detail A on page 130 which shows how the frame supporting Santa is attached to the box gutter and roof. It's permissible to drive the small nail through the shingles as later on when you remove the frame you can lift the shingle tab and seal the hole with roofing cement. Note also that the frame is assembled with corrugated fasteners.

FINAL PAINTING is done over an undercoat of flat white applied to jigsawed cutout with paint roller



DECEMBER 1962



SABER SAW makes quick work of sawing out cutout. Go over outlines with white when using hardboard



135

Натюрморт: композиция натюрморта



If you plan to use the Nativity scene as a window display, first tape large sheets of paper together and trim to fit the window opening. If your window has divided panes like that pictured, then, when you project the images, note carefully the placement of these in relation to the dividers so that the profiles of the figures and other details are not broken up. Transfer the patterns to $\frac{1}{8}$ -in. hardboard by using either of the methods described. To complete this display and give a feeling of animation, arrange a rotating color wheel and floodlight the back of translucent curtains or drapes. Spray-paint the figures in gold and add whites and browns to give highlights and shadows for day time effect.

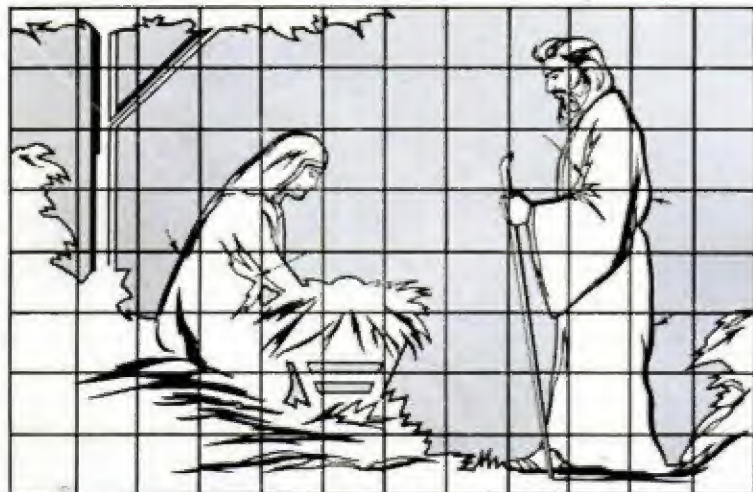
The Nativity scene also can be mounted

on a garage door. If the door is a light color, then paint the figures a deep blue or black so that they silhouette sharply against the background. If the door is of the roll-up

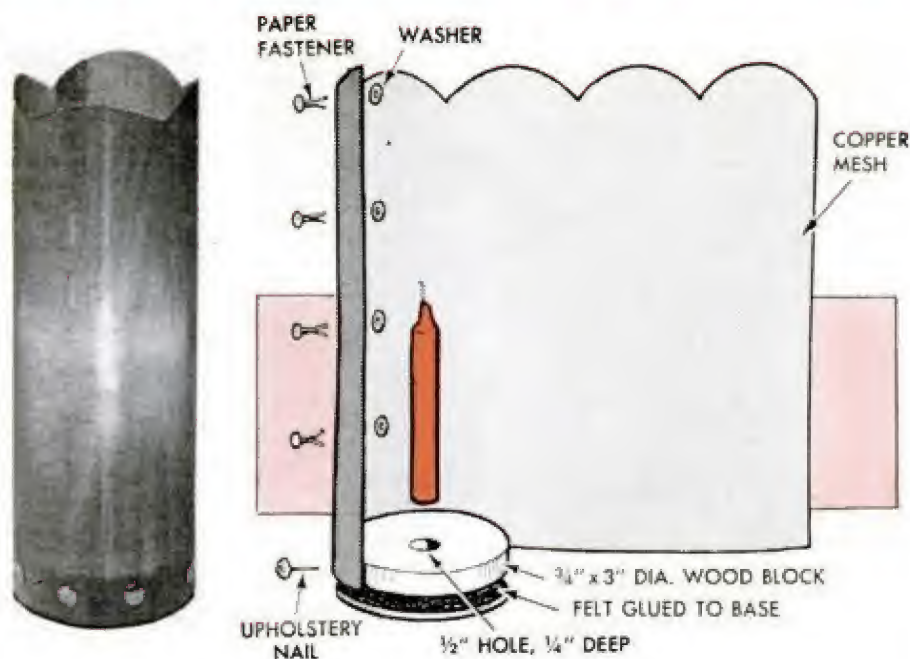
[\(Continued on page 192\)](#)

Like To See More?

We're interested in receiving your comments on our new Project-a-Plan method of enlarging magazine patterns the easy way. Would you drop us a card telling us whether you have found these paper "transparencies" helpful and what other projects you would like to have us present in Project-a-Plan form?—Thanks.



DECORATIONS FOR CHRISTMAS



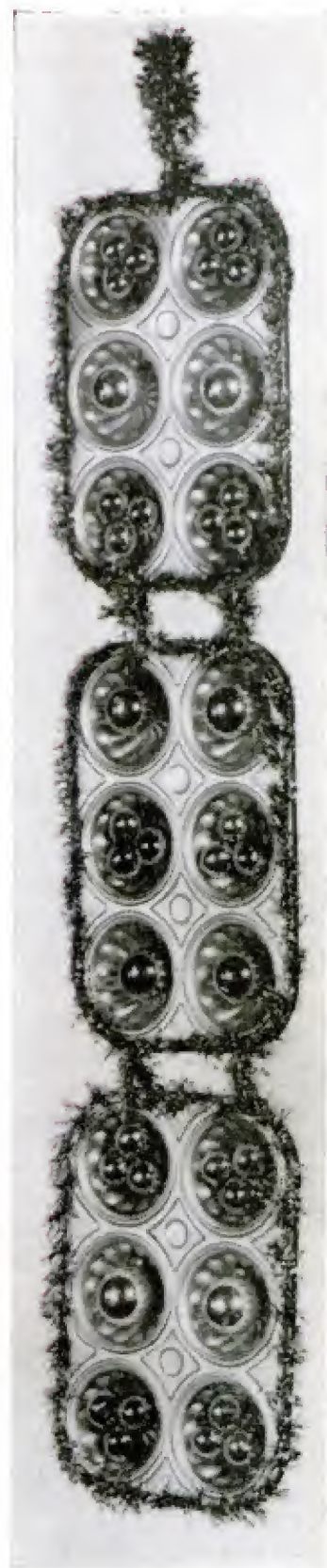
HURRICANE LAMPS of fine copper mesh permit candle light to shine through in soft glow. Each lamp is made by cutting scallops along one edge of $8\frac{1}{2} \times 10\frac{1}{2}$ -in mesh and tacking to wooden base prebored for candle. Lapped edges are joined with brass paper fasteners and washers. Bottom is covered with felt to prevent marring.—Bob Joselyn



EGG-CARTON TREE is made by stacking, nesting and gluing sliced containers pyramid fashion. Use the one-dozen-size carton, cutting each one in half lengthwise. Cut "windows" in the front, spray with gold paint and fill individual egg compartments with small ball ornaments. Perch tree on base of styrofoam and then cover with pine branches.—Louise Price Bell



HANGING DECORATION with a Yuletide note can be fashioned from toy muffin tins. Punch holes in the tins so they can be joined together with lengths of tinsel. Spray the tins with gold paint and then glue assorted red, green and gold baubles in the cups, as shown. Glue green tinsel around the edges of the metal tins and use a loop of tinsel for a hanger



TOOTHPICK CHEER



1. WREATHS may be left starkly simple, above, or ornamented with beads and artificial leaves, below



By Theodosia Carpenter

WANT TO GIVE your home an extra-special holiday sparkle this season without straining the Christmas budget? The basic materials for these glittering wreaths and ornaments are common round toothpicks and 1-in. Styrofoam balls, available at any ten-cent store. A wide range of striking effects may be obtained by spraying them with metallic paints and adding any number of imaginative decorations—sequins, gold or silver wire mesh, artificial leaves, glass beads, velvet ribbons, etc.

Dip the tip of each toothpick in glue before inserting it, and for a more professional result, cover one section of the ball at a time, Fig. 2, rather than placing toothpicks at random all over the ball. If you plan to decorate the foam ball itself with sequins

POPULAR MECHANICS



2. TOOTHPICKS should be inserted in one section at a time rather than haphazardly over the entire ball

or wire mesh, do this before you begin inserting the toothpicks.

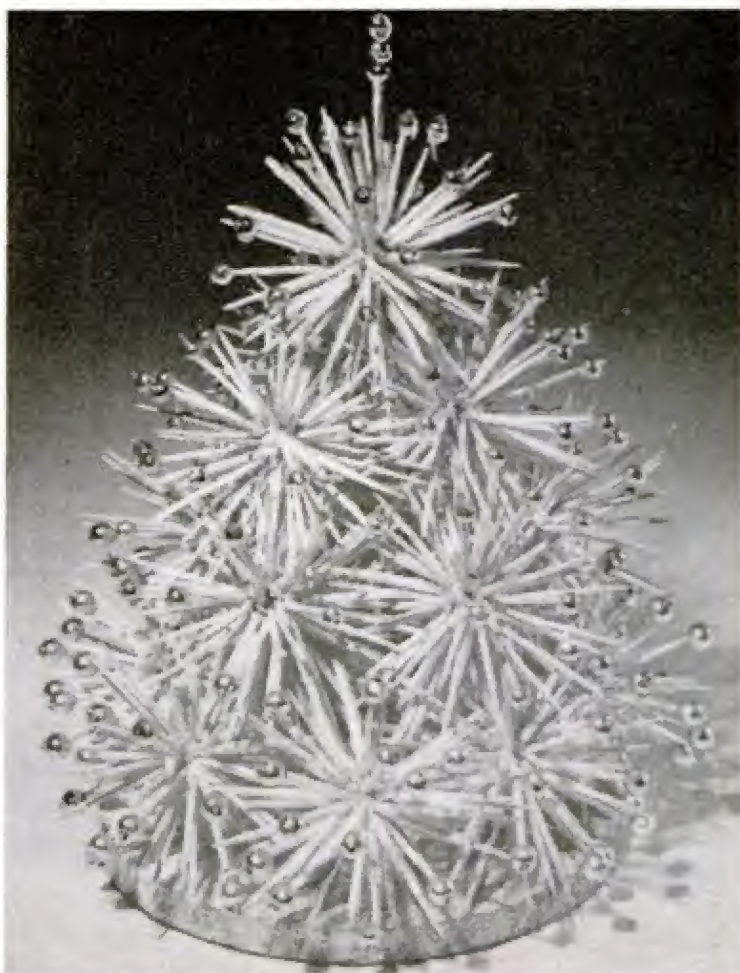
The base of the bejeweled Christmas tree, Fig. 3, is made of seven interlocking balls pressed into a foam disk. Place a drop of glue wherever toothpicks from two different balls touch so as to hold the centerpiece solidly together. Coat the whole tree with white flock spray and decorate it

with tiny beads from an old necklace.

To make a wreath, stick the balls into a foam ring, Fig. 1. You can create an infinite variety of designs by varying the decorations. If the wreath is to be hung in a window where it will be viewed from two directions, leave those parts of the balls next to the ring free of toothpicks and cover both sides of the ring.

3. CENTERPIECE, right, consists of seven balls pressed into a foam disk to form the base. For the second and third layers, use five and three balls

4. TREE ORNAMENTS are easiest to make. Decorate the ball itself with sequins, then glue extra sequins to the tips of toothpicks as a finishing touch

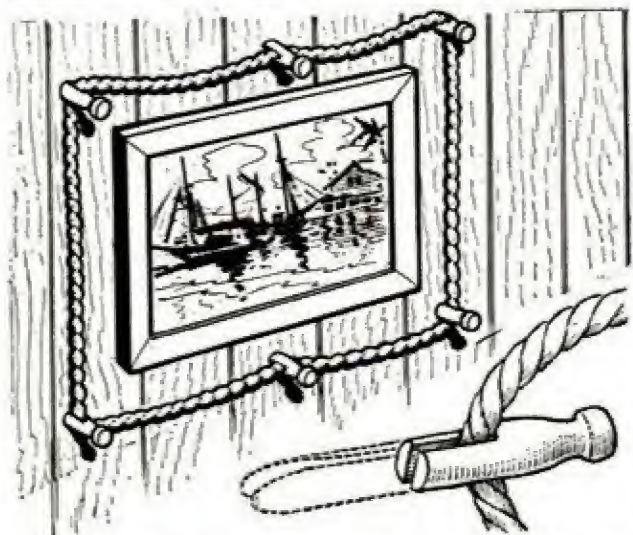




Elbow-Length Mitts

One of the discomforts of running a trapline is making underwater sets in cold weather. Badly chapped hands can result from too much of this sort of thing, if nothing worse. One trapper carries two plastic bags of the kind you buy popcorn. Before making an underwater set he slips hands and arms into the bags and fastens the open ends just above the elbows. These "mitts" take the edge off that chilling plunge of hand and arm into ice-cold water when placing a submerged trap, yet they do not interfere measurably with hand and finger movement.—*G. E. Hendrickson*

A small piece of copper fly screen laid in your log fire gives the flames the brilliance of burning driftwood. A small piece will last several months as the metal oxidizes quite slowly. Just place the piece under the kindling when you start the fire.



Nautical Touch

Here's a novel decorative idea for that paneled rec room or that corner devoted to the nautical. Only one application is illustrated which should be enough to spark one's imagination in the development of others. All you need to carry it out are an appropriate framed picture, a length of nylon rope and about six wooden clothespins. Just cut off the legs of the pins as detailed, drill holes in the wall around the hanging picture, then grip the rope in the shortened legs of the pins and drive the latter into the holes. Of course, the holes must be equally spaced and equidistant from the frame.—*Thomas P. Ramirez*

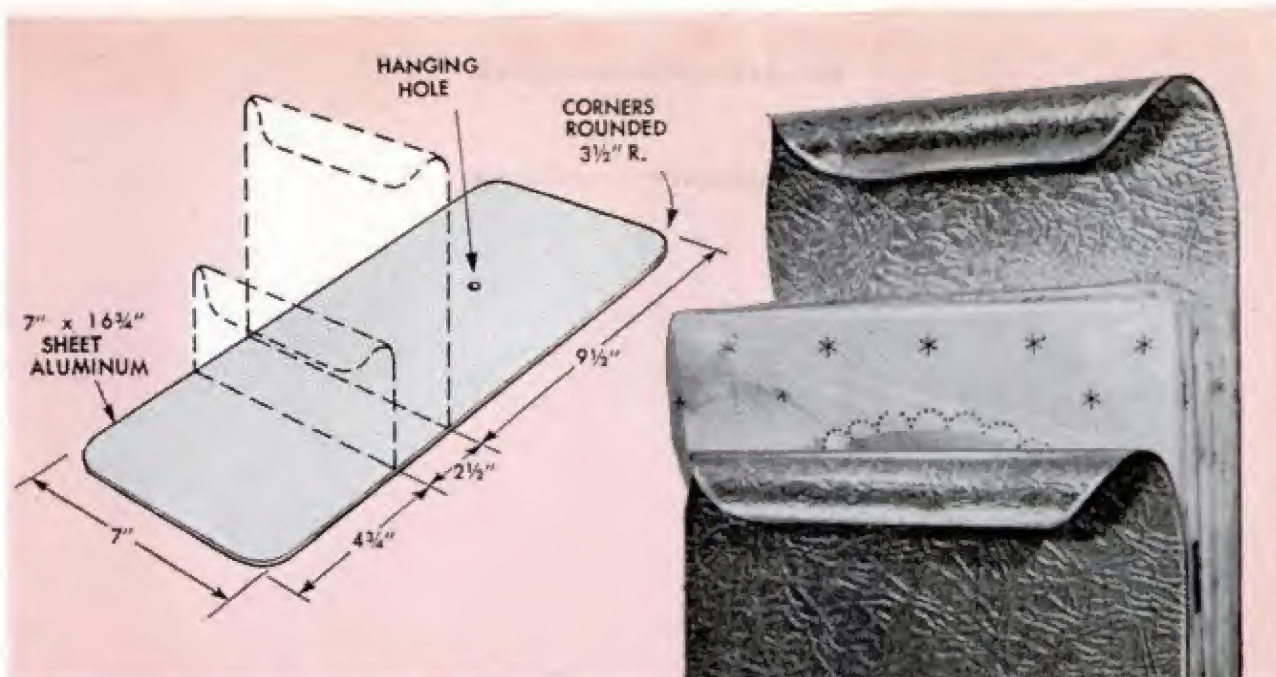


Ice Chips Afloat

Chipping fishing holes in ice a foot thick can get to be quite a chore when you have to stop every inch or so and scoop out the ice chips. Concentrate all effort on getting one hole through the ice. Then scoop up a pail of water and keep it handy for floating the loose chips as you cut the other holes. Just keep each hole partially filled with water and the chips won't impede progress. And you save the time consumed scooping them out every minute or so.

—*George Goodwin*

Ever try to cut sheet rubber with scissors? If you have, then you'll appreciate this suggestion: Tape a piece of cellophane to each side of the rubber sheeting where the cut is to be made. The cellophane prevents the rubber sheet from creeping while cutting.



ALUMINUM NAPKIN RACK

PAPER NAPKINS are always conveniently at hand when kept in this attractive one-piece, kitchen wall rack. It's a simple one-evening project and a quickie last-minute gift for the house. The rack is fashioned from a single piece of embossed sheet aluminum, measuring 7 x 16 $\frac{3}{4}$ in., which is available in different designs from self-service racks in many hardware stores. Begin by cutting the four corners on a 3 $\frac{1}{2}$ -in. radius as shown. Ordinary scissors can be

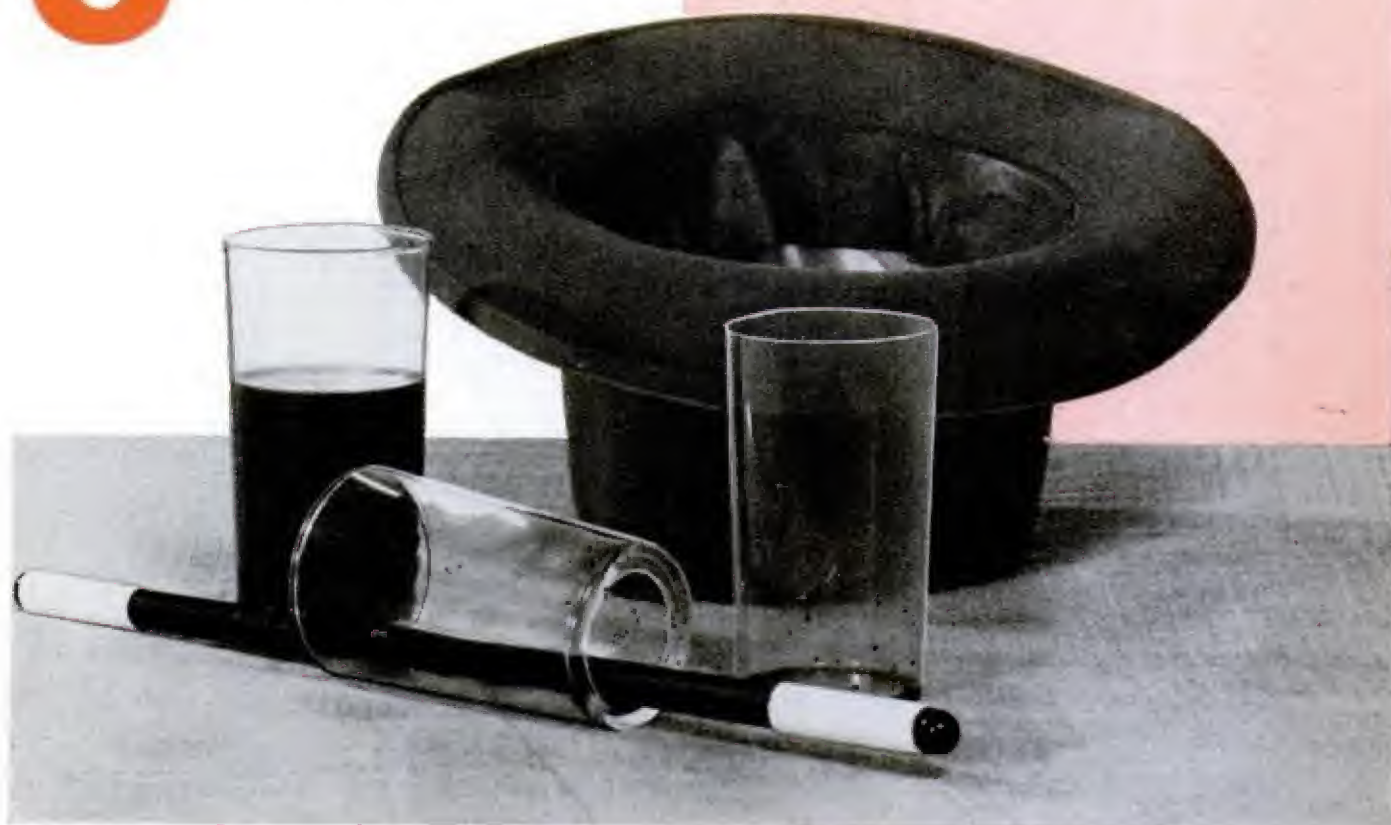
BENDING the soft aluminum is easily and quickly accomplished by holding the sheet firmly over the edge of a table (right) with one hand while applying a downward pressure with the other

ROLLING the curled ends of the aluminum sheeting around a broomstick imparts a distinctive styling to the completed napkin rack which is in keeping with the embossed design of the sheeting itself

used for this. Then curl the two ends by rolling the soft material around a broomstick. Make the two right-angle bends in the sheet by forming them over the sharp edge of a table or workbench. Finally, punch a hole at the point indicated for hanging the completed rack with a thumbtack. Leave the napkins in their plastic wrapper, but slit the top for easy removal. The same rack could be put to use as a place to store pot holders.—Ken Murray



8 MAGIC TRICKS



By **Byron G. Wels**

MAGIC! The word has an exciting ring to it, for everybody enjoys the fun of fooling, being fooled and trying to out-guess the magician. It's easy to master the mechanics of these tricks, the difficult part is convincing people that you really *are* a magician. Obviously, the boy wearing everyday clothes is an everyday boy, not a magician. But put him in a turban or a top hat and . . . well, *there's* a magician.

Remember that an important ingredient in any magic act is "patter," a steady flow of words to distract the audience. Misleading actions also play a big part. Wave a handkerchief high in the air while shouting "Look!" and you can slip the (supposedly) disappearing object into your pocket without the audience ever noticing. They'll be too busy watching the handkerchief!

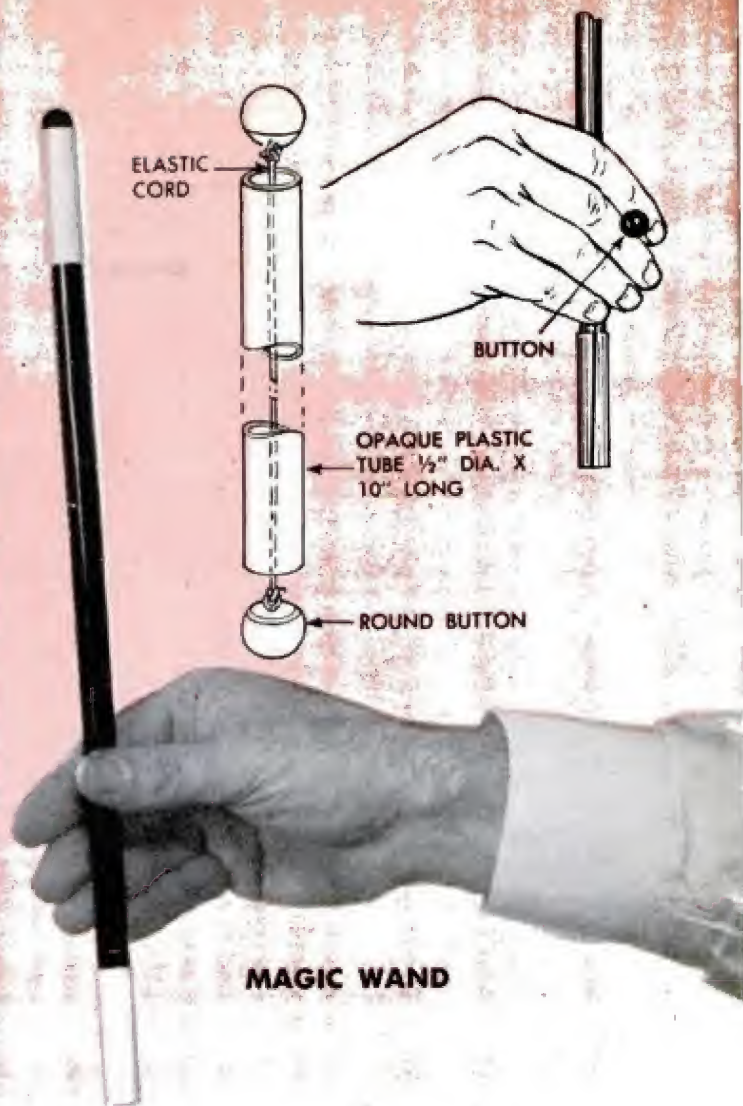
MAGIC WINE GLASS For this humorous trick you'll need a straight-sided drinking glass with the bottom removed and a thin-walled clear plastic tumbler large enough to hold the bottomless glass. Borrow a hat from the audience, place it brim-up on the table and put the nested glasses inside. Pretend that you are about to pour wine (colored water) into the glass inside the hat, then hesitate and explain that you

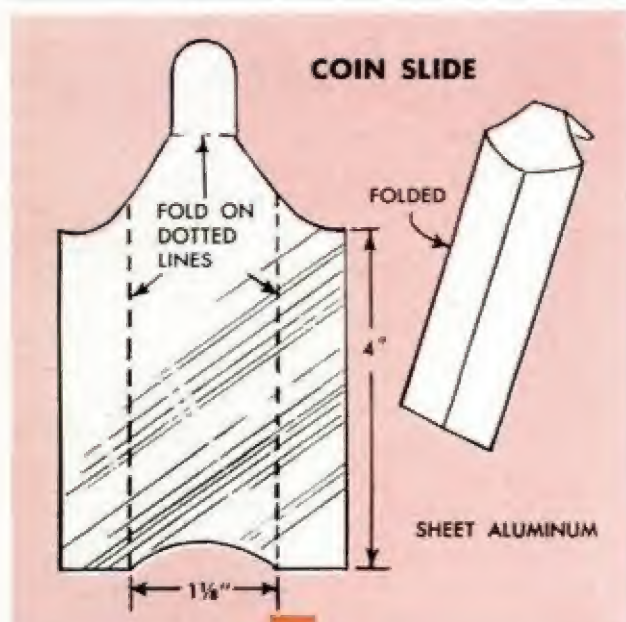


can't seem to remember the trick, but you think that the glass belongs outside the hat. Slip the bottomless glass out of the plastic tumbler, place it on the table, and pour the liquid into the supposedly empty hat. Next, glance down into the hat, act embarrassed and mutter something about a "mistake." Then brighten up, put the bottomless glass back in the hat (slipping it inside the full tumbler), make a few passes with the wand and lift the full glass(es) out of the hat. Finally, hold up the hat to show that it's empty and unharmed.

YOUR MAGIC WAND Here are a couple of quick tricks in which the wand itself is the apparatus. Offer to allow a member of the audience to do the next trick, but as you hand him the wand make it jump away from him, toward you. Then explain that you will have to do the trick yourself, as the wand doesn't want to work for him. Or you can roll the wand up in a newspaper, tear the paper to shreds, toss the pieces into the air and the wand will have vanished.

The trick wand is a hollow plastic tube fitted with a button at each end. The two buttons are connected by a rubber band running through the tube. To make the wand jump, hold one of the buttons between your fingers, pull the wand to stretch the rubber and grasp the body of the wand with thumb and forefinger of the same





hand. Release the thumb pressure and the wand will move.

For the newspaper trick, pin one button inside the sleeve of your jacket and stretch the rubber band so that you are holding the base of the wand. When you release it the wand will jump back into your sleeve.

ELBOW PUMP People always watch the magician very closely, so when you can fool the victim of your trick, you have really accomplished something.

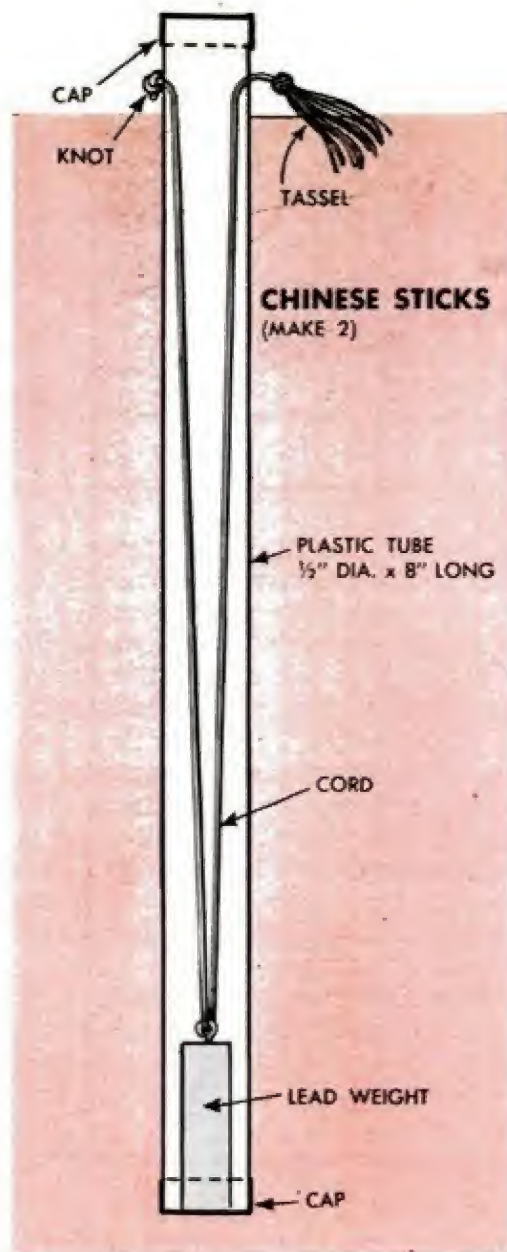
Call for a volunteer and ask him to roll up his sleeve. Examine his arm and exclaim, "Why you poor man! You have water-on-the-elbow." Then grasp his elbow with one hand, hold his wrist with the other and work his forearm like a pump handle. A steady stream of water will spurt from his elbow, much to his own amazement and the delight of the audience.

The secret is a small rubber sponge, filled almost to capacity with warm water. Conceal this loaded sponge in your palm and press it against the elbow to make the water flow.

COIN SLIDE The magician borrows a coin from a member of the audience and asks that it be marked in such a way that it can be identified later. A soft lead pencil works well for such marking. Quickly, the magician puts his hand behind his back and brings out a small box bound with rubber bands. The marked coin is no longer in sight.

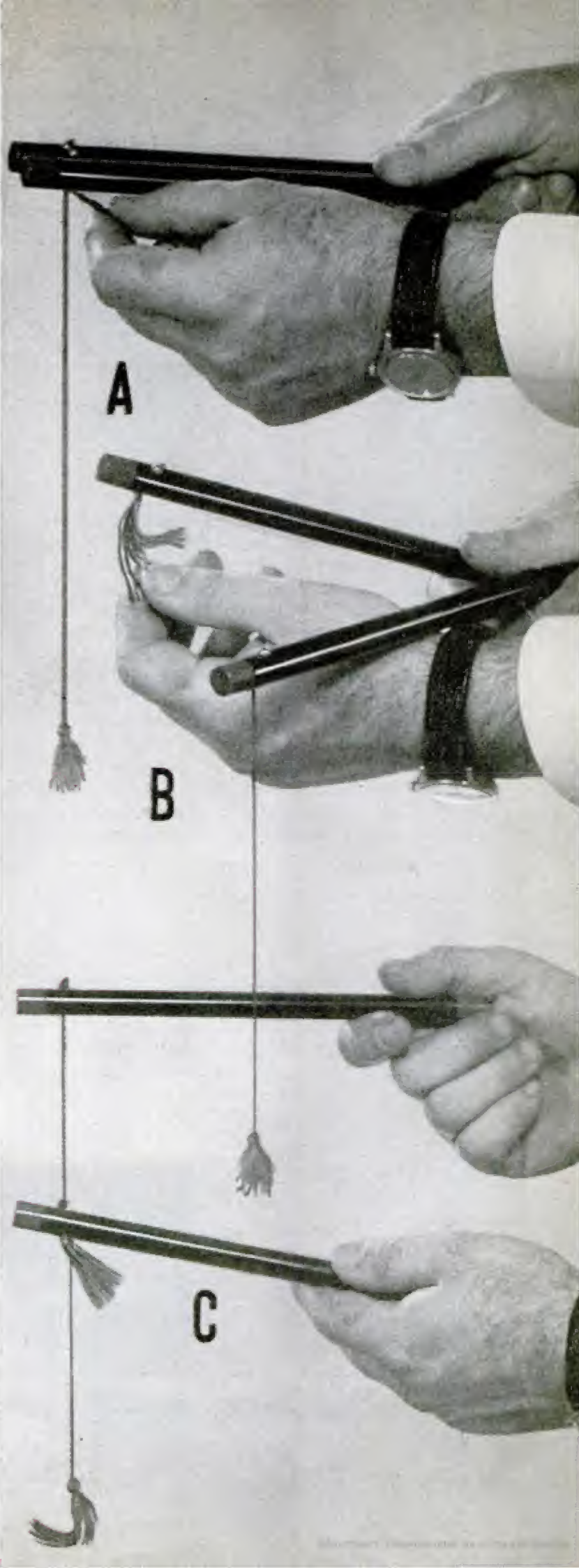
The magician gives the box to the volunteer and directs him to remove the rubber bands. Inside, he finds a smaller matchbox, also bound with rubber bands. Upon removing these rubber bands and opening the matchbox, he discovers a small cloth pouch securely sealed with another rubber band. When he opens this pouch, there is the marked coin!

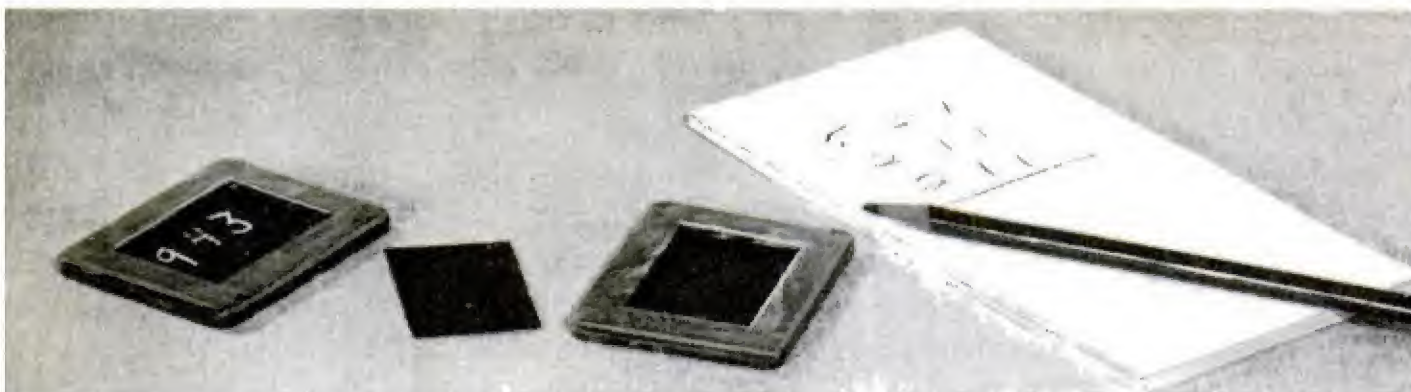
The secret of this trick is a special coin slide made from sheet aluminum. The top of the slide is bent to form a hook. Prepare this trick by placing the straight end of the slide inside the small pouch, and secure the pouch to the slide with a tight rubber band. Next, place the pouch and straight portion of slide in the matchbox and bind with more bands. Don't worry about the box not being fully closed, as the bands will snap it shut when the slide is removed. Place the matchbox inside the last box, and bind it shut. Then suspend the box-slide unit from your belt by the hook. When you receive the marked coin, drop it into the top of the slide and in the same motion, pull the box from the slide. The slide will remain suspended from your belt concealed by your coat.



CHINESE STICKS The magician displays a pair of parallel sticks, each with a tassel dangling from one end. As he pulls on one tassel, the other one rises. Then he separates the tasseled ends of sticks and repeats the tassel-pulling routine. The audience suspects that the string runs through the rear ends of the sticks, and shouts, "Separate the sticks," but the magician pretends to misunderstand and separates the tasseled ends still more. When the audience shouts again, he suddenly appears to understand their meaning and places one stick in his mouth to show that there is no string connecting the two. He pulls the tassel dangling from the stick in his hand, and the other tassel rises!

The sticks are constructed from plastic tubing about $\frac{1}{2}$ in. in diameter, and the movement of the tassels is controlled by small lead weights inside the sticks.





SPIRIT SLATES The magician shows sides of a pair of blank slates, then places them one upon the other and binds them together with a rubber band. After putting the slates on a table and covering them with a handkerchief, he walks out into the audience with a pad and pencil. He then asks a volunteer to write a three-digit number at the top of the pad, moves on to another person who writes a second number under the first and to a third who adds another number. The magician draws a line under the last number and gives the pad to a fourth volunteer who adds up the numbers. When he has arrived at the sum of the three numbers, he calls it out so that the audience can hear it. The magician then returns to the stage, uncovers the slates, removes the rubber band and there, written

for all to see, is the total just given.

To prepare the trick, write three three-digit numbers in a column on the pad. Find the total of these numbers and write this number on one of the slates. Now turn over the pad and remove the cardboard backing.

Prepare a piece of black cardboard or poster board to fit inside the frame of the slates. This cardboard covers the number and looks like a part of the slate. Thus, when you show the slates the first time, they appear to be blank. When you unwrap them, tap the back of the numbered slate so the cardboard drops to blank slate.

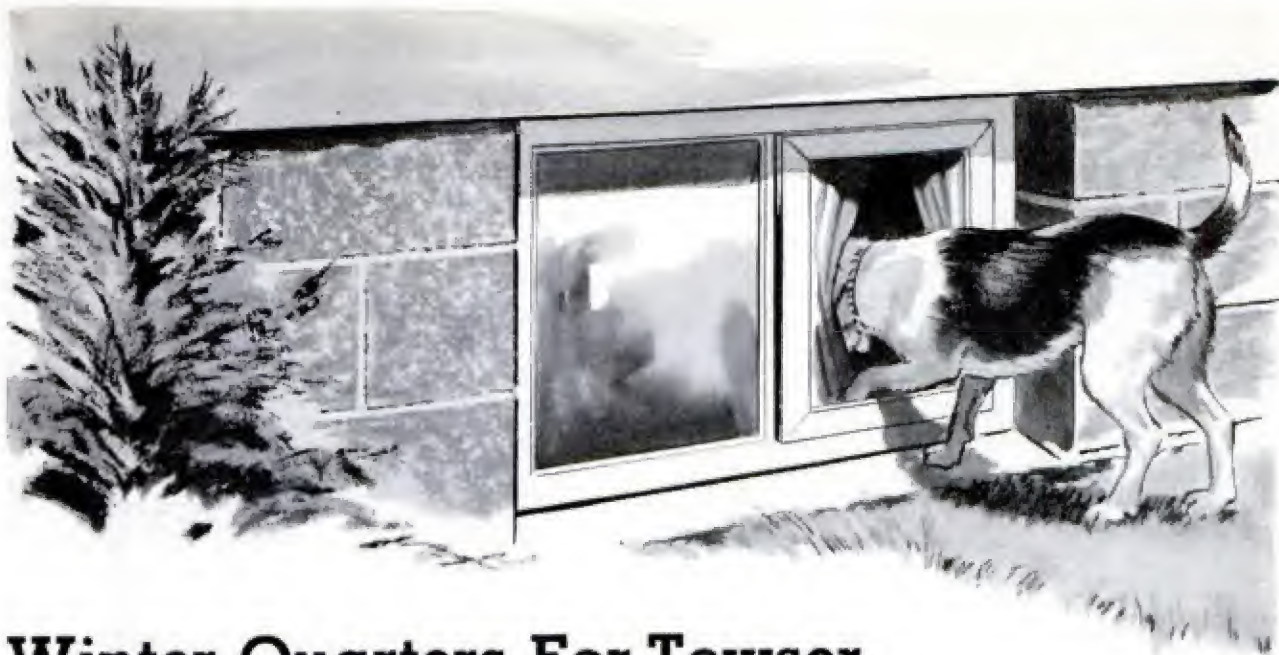
When you ask the volunteers to write numbers on the pad, they will write on the blank side. However, when you recover the pad, draw the line under the numbers *on the other side*.

DISAPPEARING QUARTER Again, the magician borrows a quarter from the audience. He covers the coin with a handkerchief, pulling the kerchief tight so that the audience clearly sees the outline of the coin. Then, holding the handkerchief over the mouth of a glass, he releases the coin and the audience hears a "clink" as it drops into the glass. But when the handkerchief is removed, the coin has vanished and the

glass is empty!

Actually, the magician substitutes a glass disk the size of a quarter, and slips the quarter into his pocket while the audience is looking at the handkerchief. It is this disk that drops into the tumbler, and as the audience is looking for a coin, the glass disk is invisible. You'll find that the flat lens from a small flashlight is an ideal substitute for the quarter in this trick. ★★★



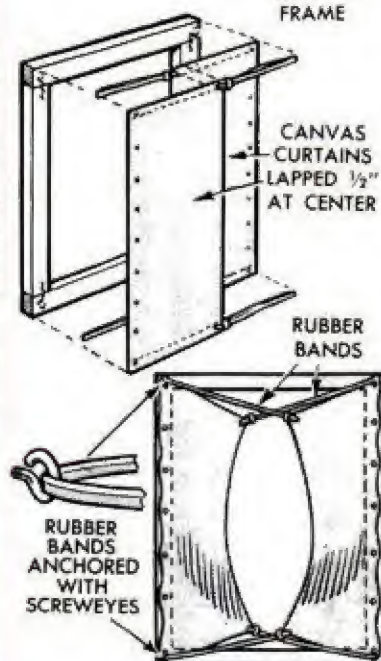
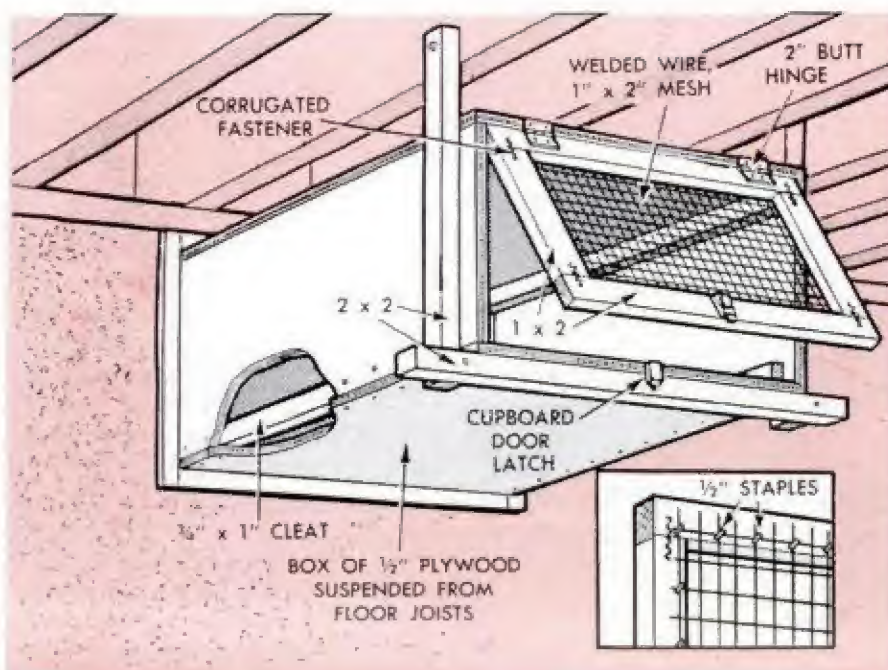
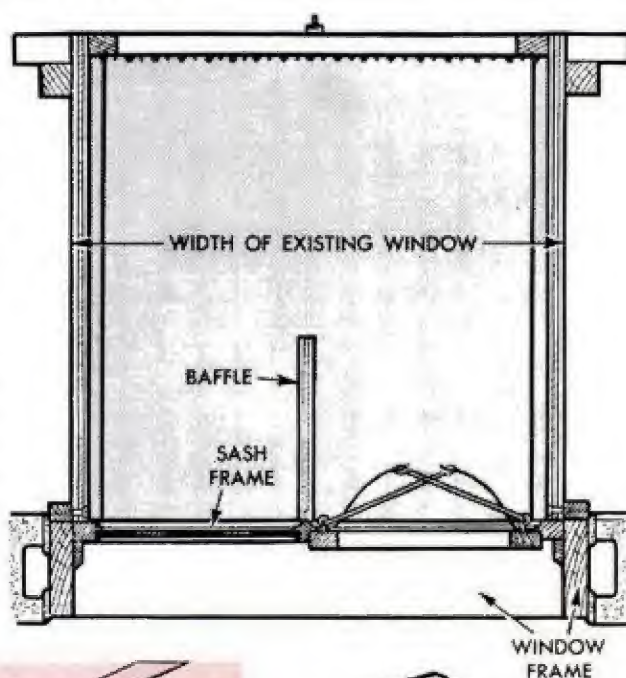


Winter Quarters For Towser

THIS FREE ACCESS, basement-window dog-house enables Towser to come and go as he pleases while providing him with warmth and comfort on wintry days. Suspended from the floor joists at a window near the furnace it benefits from basement heat. Self-closing canvas curtains and a baffle keep out drafts. A hinged door on the basement side provides for feeding the dog, as well as for cleaning the interior of the doghouse.

The curtained doorway frame fits in the glass rabbet of the removed window pane. Rubber bands to hold and activate the curtains may be cut from an old inner tube. Base all dimensions on the size of your basement window and your pooch.

—Hi Sibley





SNOWFLAKES TO ORDER

By R. J. DeCristoforo

THESE PAUL BUNYAN-SIZE snowflakes may look like they were snatched right out of a North Woods blizzard, but underneath all that sparkle, they're made of scrap wood. And in spite

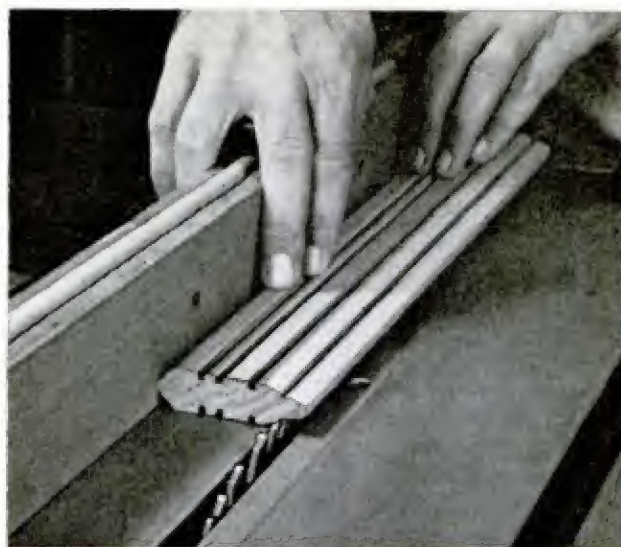
of the complex appearance, construction couldn't be simpler.

Begin by making several lengthwise cuts and holes in a scrap piece of wood to obtain an interesting cross-sectional shape. Any type of wood may be used, although hardwoods should be avoided, if possible, since they are more difficult to work. After shaping, cut the block into thin slices and assemble these sections with staples or glue on a flat surface. Then finish and decorate with sequins, "canned snow," colored gravel, mica flakes—any colorful material, but the more glitter the better.

When making the more complicated star-shaped clusters, be sure that you cut the bottom bevels so that a specific number of pieces will form a complete circle when



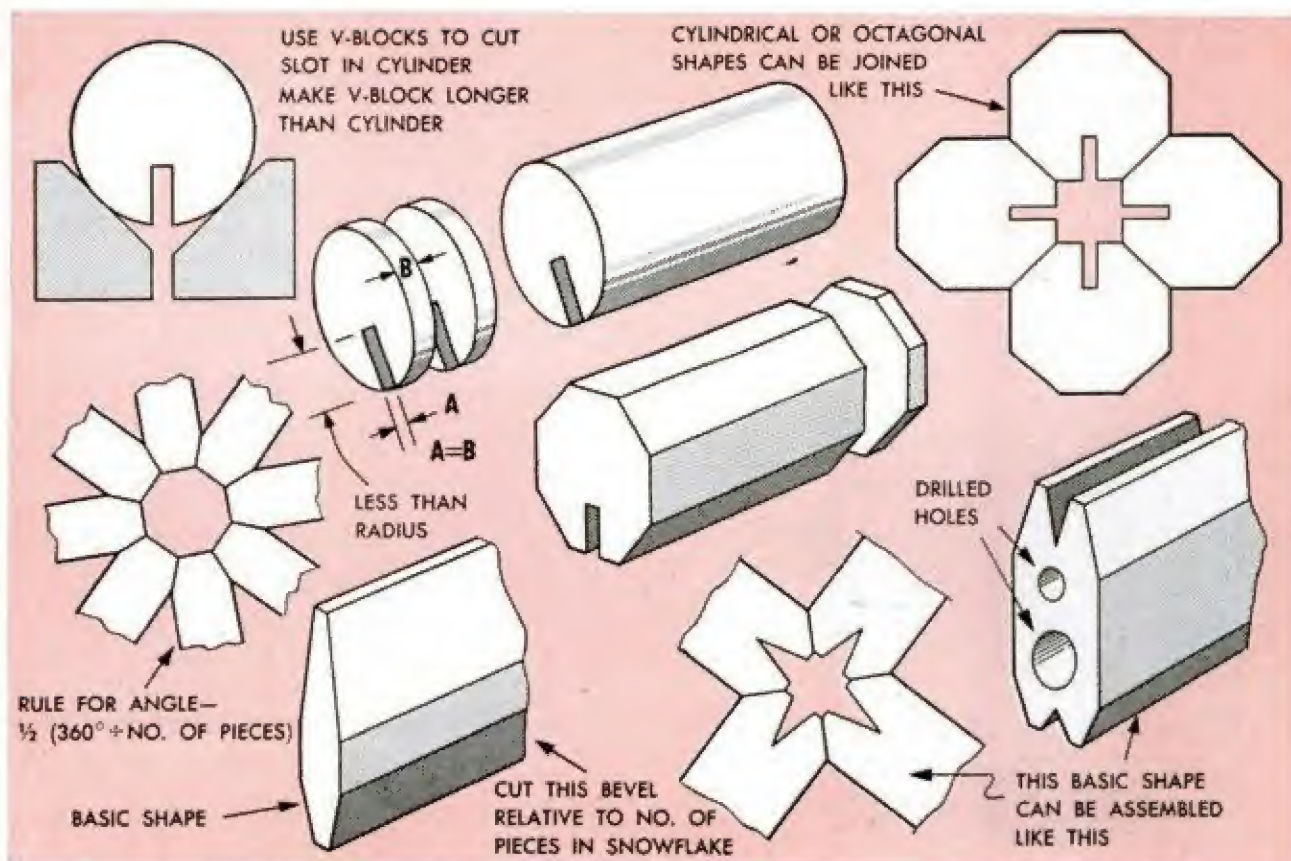
USE SPACER between blade and saw fence to gauge thickness when cutting shaped block into sections



MAKE SEVERAL longitudinal cuts in block to obtain desired cross-sectional shape for snowflake pieces



STAPLE SECTIONS together to form snowflakes, then seal, finish and cover with glittering decorations



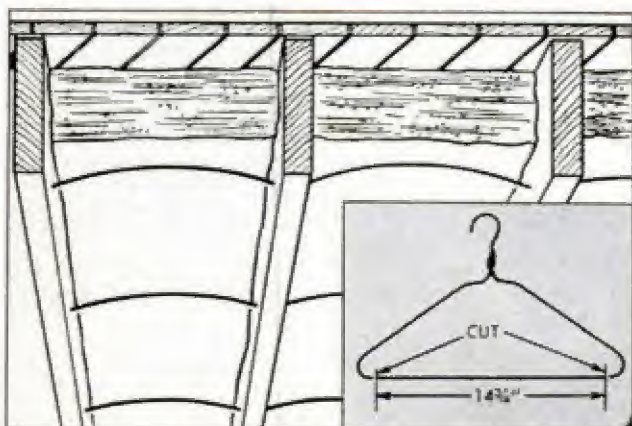


ADD GLITTER to your snowflakes by coating them with clear adhesive, then sprinkling with sequins, etc.

joined. First, decide how many pieces you want to use. Then divide 360 by this number to obtain the total number of degrees for the two bevels of each piece. Half of this number will be the correct angle to set the saw blade for cutting each bevel.

If you plan to staple the sections together, work on a soft surface (a piece of foamed plastic makes an ideal work surface), and use staples about $\frac{1}{8}$ -in. longer than the thickness of the sections. When you drive the staples, they will protrude on the opposite side of the material, allowing you to bend the ends over for a stronger assembly. If you don't have a staple gun, the sections may be joined with glue or contact cement.

It's a good idea to seal the assembled flakes before finishing and adding the decorations. Pour some shellac into a shallow pan and dip the entire flake. You can paint the flakes before decorating.



Coathangers Support Insulation

One of the problems of applying insulation in an electrically-heated home has been solved with the old, familiar wire clothes hanger. It was discovered that lengths of wire cut from clothes hangers and wedged up against the insulation worked perfectly for holding the 6-in. batts in place under the floor with the vapor barrier on the warm side. This lets the insulation retain its desired thickness, but holds it firmly.

—Marvin Stacken



How to Spoil Your Dog

Even dogs enjoy a little taste of luxury, and here's an economical air mattress for Fido that will be an instant hit. Just inflate an old inner tube inside a burlap bag and tie the bag shut. Any dog prefers a comfortably "hollowed-out" bed, so don't make the top drum tight. Since burlap bags are available in several sizes, you can even tailor the mattress to fit your dog. Just use a tube from a compact car for a small dog, and a standard tube for a larger dog.

—C. L. Furr

● Birds sometimes learn each other's languages. In France, the rook, carrion crow, and jackdaw spend the winter in mixed flocks where they learn one another's calls. Yet, American eastern crows, which are members of the same species, do not understand the calls of others of their kind living in a different area.



NEW FOR SHUTTERBUGS NEW

1. HOME MOVIE PROJECTOR features a Magi-Cartridge for 8-mm. film that eliminates threading, re-winding, reels and sprockets, making operation child's play. Snap-in cartridge can be loaded with 50 ft. of film. Has Technor f:1.5 precision-ground zoom lens. Produced by Technicolor Corp., Hollywood, Calif.

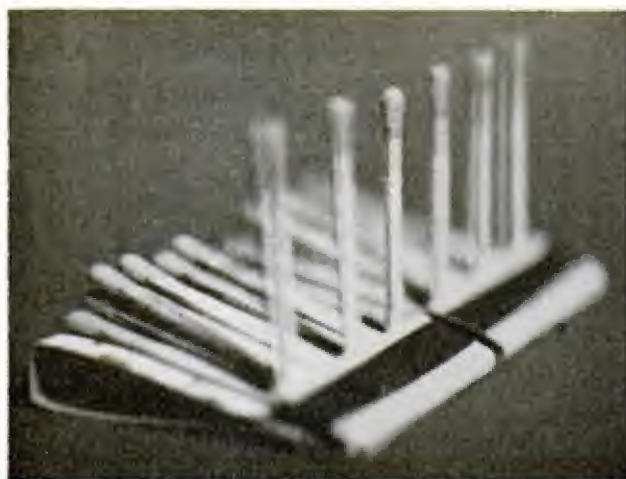
2. MICROFILM CAMERA records documents or drawings up to 12 3/8 in. wide on 16 mm. film. Reduction ratio is 24 times. Operates on 115 volts AC, weighs 21 pounds. Exposed film can be removed at any point in operation with loss of only 6 ft. of unexposed film. Available from Microdealers, Inc. Waltham, Mass.

3. EXPOSURE METER is activated by on-off switch to conserve mercury battery in bottom. YEM-35 fits many cameras with standard shoes, is 2 x 1 x 1 in. in size. Speeds range from 1/1000 to 8 sec.; apertures from f:1.0 to f:32; ASA values from 6 to 12,000. Product of Yashica, 50-17 Queens Blvd., Woodside 77, N.Y.

4. SLIDE VIEWER handles up to 25 slides without reloading. Ikoscop is 3 x 5 x 6 in., can be used in a fully lighted room. Uncut and unmounted transparencies and negatives may be viewed by means of a filmstrip holder accessory. The price is \$14.70. Carl Zeiss, Inc., 444 Fifth Ave., New York 18, N.Y.

5. INSTANT FILM DRYER is applied for two minutes after usual processing and washing, drying film instantly after squeegeeing excess solution. Hardens emulsion and makes it scratch resistant. Does not deteriorate with use. Pint costs \$2.25. Yankee Photo Prod., 3325 Union Pacific Ave., Los Angeles 23, Calif.





1. **DOUBLE IMAGES** appear at points that are out of focus when light block is placed over viewing lens



2. **SAME VIEW** as it appears without the light block where sharpness of focus must be determined by eye

Easier Focusing with Twin-Lens Reflex

SHARPLY FOCUSED IMAGES are assured with a twin-lens reflex camera, without eyestrain or guessing, by using a simple, X-shaped light block such as shown in Figs. 3 and 4. It is held in front of the viewing lens by means of a filter adapter, and produces double images of objects in areas that are not in focus as is shown in Fig. 1. As soon as you adjust the focus so the two images merge together to form a single image, you have reached the point of maximum focus.

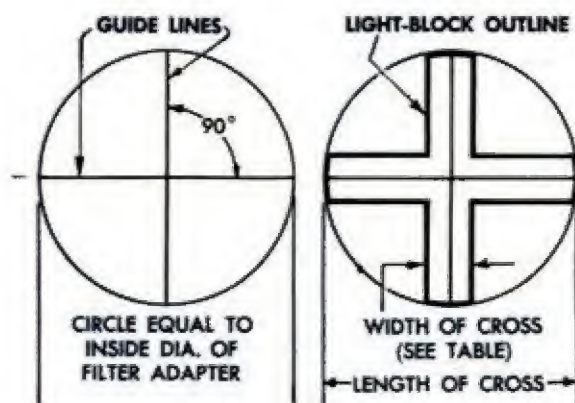
This is much easier on your eyes than focusing in the usual manner to bring an image such as that shown in Fig. 2 into sharpness visually. However, an exception to this technique is the focusing of large, uniform areas such as a lake surface or a stretch of sandy beach. In such cases, focusing must still be done in the usual manner without the light block.

A temporary light block can be cut from stiff cardboard such as Bristol board, and a permanent one from light sheet aluminum. Use the filter adapter ring as a guide in making it. First scribe a circle equal to

the inside diameter of the ring at the point where the filters are held. Mark two diametric lines at right angles to each other to serve as centerlines for the cross bars. These differ in width for various lenses as indicated in the table. Pencil the widths with fine lines on cardboard, or scribe them on aluminum. Use a razor blade in a suitable holder and a steel rule as a straight-edge to cut the cardboard accurately. To cut aluminum, back the piece with wood, grip both in a vise and use a fine metal-cutting saw. A metal-cutting snips tends to curl and distort the bars.

A light block made to proper size as indicated in the table produces a pronounced double image while reducing the light transmission of the viewing lens less than one f-stop. This light loss is not objectionable in any but the dimmest lighting conditions in which case the light block can be removed as easily as a filter. If your camera produces a ground-glass image which is bright in the center and dark on the edges, its viewing system probably is not equipped with a field lens. Then you can improve

3. **X-SHAPED LIGHT BLOCK** is placed in filter adapter ring and is held securely with the retaining ring





4. BARS OF LIGHT BLOCK should be set vertically and horizontally to get the best double-image effects

dim-light focusing with a Fresnel type field lens. This costs only a few dollars and can be installed by yourself or a camera repairman. It will produce a more evenly lighted and easily viewed image, whether or not you use a light block.

To get the best double-image effects, adjust the adapter so that the light-block bars are vertical and horizontal. Then the vertical segment produces double images of the vertical elements in a scene such as telephone poles, and the horizontal segment produces a double image of the horizontal elements in the scene.

For your first test of the light block's effectiveness, set the camera 5 or 6 ft. from a Venetian blind and focus on the slats, both with and without the light block. You'll notice the difference at once and how easy focusing is with the light block.

—Joseph R. Noonan

WIDTH OF CROSS BARS

(Read across)

Aperture of Viewing Lens	Focal Length	Width of Cross Elements
f/3.5 or 3.2	75 to 80mm.	5/32"
f/2.8	75 to 80mm.	7/32"
f/3.5	60mm.	7/64"
f/2.8	60mm.	5/32"

DARKROOM HINTS

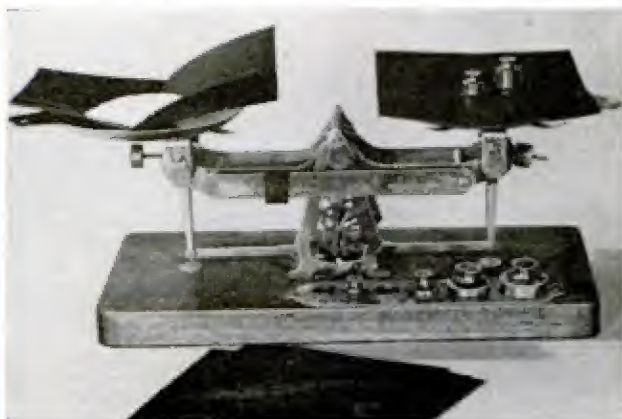


Fruit-Jar Graduate

Measuring of chemical solutions can be done accurately with a fruit jar of either pint or quart size. Attach a strip of masking tape vertically to the outside of the jar and mark this in ounces. To determine the correct location of the marks, pour known quantities of water into the jar as measured with a graduated cup or a nursing bottle. Add one or two oz. of water at a time and mark, or else add six oz. or more to two already marked, and then divide the distance on the tape equally to correspond to the number added. Coat the tape with clear lacquer or nail polish to keep it clean.—Wayne Floyd

Sheets to Weigh Chemicals

Instead of throwing away the paper separators that come from boxes of sheet film, keep them for weighing chemicals. Use two sheets of identical size, one in each pan of a balance. The one used for the chemical should be creased centrally at right angles thus forming a depression that will hold it. The sheets should not be reused but should be discarded after serving this purpose.



SHOP SHORT CUTS

Plaster Catcher

Before you cut an opening in a plastered wall for an outlet box, or for some other purpose, tape a cardboard box to the wall just below the point where the opening is to be made. The box will catch the bits of plaster, pieces of lath and most important, that flour-fine plaster dust that is so difficult to get up off the floor. Even the vacuum cleaner won't pick up all of it.

Wooden drawer knobs that have worked loose can be tightened. Remove the screw, then dip a length of small cotton cord in shellac and wind in the spaces between the threads. Replace the screw, turning it in tightly.

Solder Cache

No serious handyman or modeler ever runs out of solder at a critical stage of the project he's working on—or does he? To prevent this ever happening unwind a length of wire solder from that new spool you just bought and rewind it—not too tightly—on the soldering-iron cord. Wound on the cord the extra supply is never in the way and does not interfere with normal use of the iron.—*Louis Yates*

Steel-Wool

Fine steel wool can serve as a carrier, or bridge, when it is necessary to fill a hole with solder. Use a pinch of wool just large enough to fill the hole loosely, dip in liquid (acid) flux and heat slightly to flow the flux through the wool. Pre-heat the metal around the hole very nearly to soldering temperature. Then press the wool in place and flow solder over it. As soon as the work cools file the solder patch flush with the surface. Use of a torch will make this job easier and faster.

Wrenching Problem

You have a set of socket wrenches but obviously you can't use them to loosen that stubborn locknut you see in the photo. It's turned down too far on the stud. You have no open wrench that fits and you can't use the pipe wrench as the alligator jaws will burr the corners of the hex nut, which, in this case is not permissible. What to do? Simple. You just drop the socket down over the stud and onto the nut. Then turn it with the pipe wrench. This solves the problem and does no damage to the socket, as it's hardened.

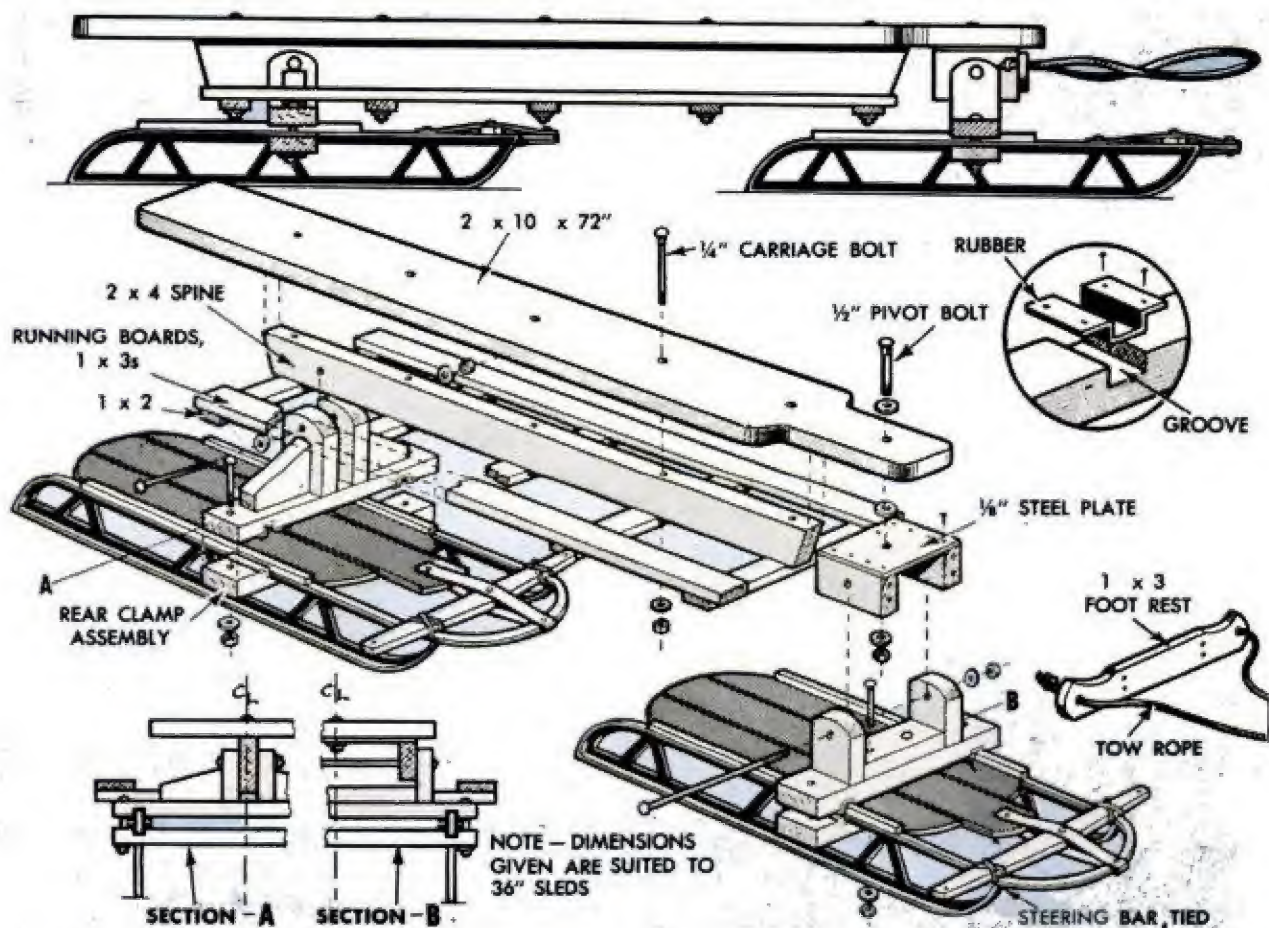




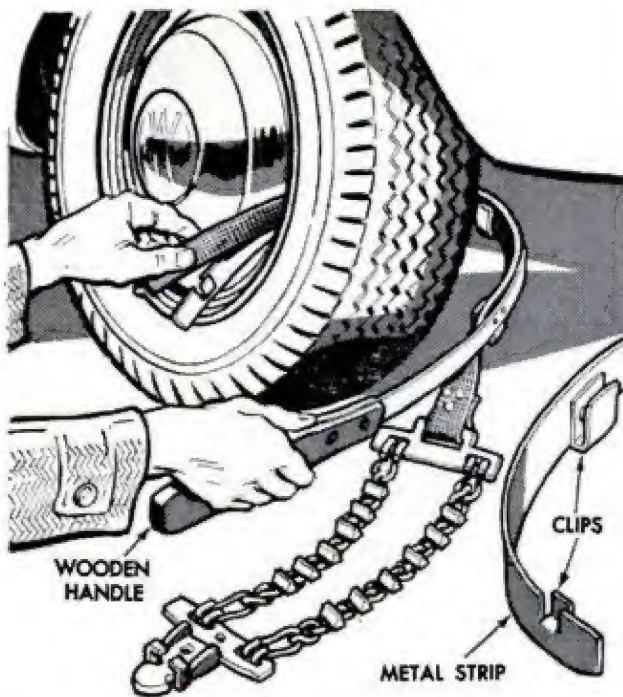
Jiffy Bobsled Uses Clamp-on Sleds for Runners

What's the hardest part of making a bobsled?—the runners. But that's not the case with this bobsled. You simply clamp on two regular sleds for the front and back runners, jump on and away you go. The bob part is a plank affair fitted with running boards and stiffened down the center with a 2 x 4. Pivoting clamp assemblies provide

rocker action to both sleds, and steering is done with the feet placed against the foot-rest. Note that the steering bar of the sleds must be made immovable by making secure with cord bound around the sled rails. Circular detail shows how grooves in the ends of the clamping assemblies are fitted with rubber to grip securely.—Hi Sibley



Better CARKEEPING



● **MOUNTING** emergency tire chains is a dirty job, but here's a simple tool you can keep in your trunk which will take much of the work out of this task. It's just a curved metal strip with clips riveted to the inner surface. To use it, slip the webbed strap from the chains into these clips and hook the tool around the wheel through the spokes. This places the end of the strap within easy reach for fastening

● **MANY OLDER-TYPE** automobile lifts release an ear-splitting blast of air when lowered. Noticing that this sudden loud noise frightened a number of his lady customers, one service station operator tried diverting the discharging air stream through an automobile muffler. Result? Just a quiet 'shhhhhhhh' when the lift is lowered, and no more frightened customers



● **CAR WINDOWS** will last longer and operate more smoothly if you lubricate the gears periodically. To do this, flare one end of a length of copper tubing and push the other end down through the space between the window glass and frame until it rests on the gear. Then squirt a few drops of oil into the tube so it will run over the gear

● **WHEN REPLACING** a generator or voltage regulator which has been disconnected from the circuit, be sure to polarize the generator with the regulator. Before starting the engine, momentarily short the generator and battery terminals from one to the other. This permits a flow of current through generator, correctly polarizing it with regulator

● **REPAIRING** an otherwise good muffler in which the inner shell has broken loose takes only a few minutes. To stop that annoying rattle, simply punch a small hole in each end of the muffler and turn in self-tapping screws. Be sure to use screws that are long enough to go up snugly against the muffler's inner shell so it will be locked firmly in place

● **COMMON PROBLEM** with dual exhaust systems is rusting of the muffler and tailpipe on the side where the heat-riser unit is installed. Since this is due to condensation, you can correct it by bending the flat striker spring on the heat riser slightly to make the valve stay about one quarter open. The hot exhaust blow-by will prevent condensation

● **CLUTCH CHATTER** is often caused by oil leaking into the clutch housing around the flywheel mounting bolts, especially on older models. One mechanic, who ran into this problem repeatedly, discovered that the simplest and most effective method of stopping such leakage is to paint the bolt or stud threads with one of the liquid gaskets sold in squeeze tubes

● **TO BLEED** brakes after overhauling cylinders, replacing lines, etc., press the pedal down firmly and block it in that position. Then, taking one wheel at a time, open each wheel cylinder bleeder valve just enough to let a few drops of brake fluid escape. This will clear the whole system of air even more efficiently than using a pressure bleeder

COOK YOURSELF

X.547



By John Burroughs

1

HERE'S A VERY EASY WAY to make yourself a top-quality rubber stamp: First take an impression of printer's type in talc-polyester putty. Then clamp a piece of inner tube hot-patching gum against this matrix and cook the whole works in a kitchen oven to vulcanize the gum. Mounting the cured gum on a suitable wooden block with a handle finishes the job.

COULD YOU USE a custom-made rubber stamp of your signature? Or a stamp with your name and address to personalize stationery? By modifying the procedures of commercial stampmakers, you can cook up top-quality low-cost rubber stamps right in your own kitchen.

The normal routine in a commercial shop is to set the stamp copy in type, then take an impression of this in plastic. (In the case of a signature or drawing, an engraving must be made and the impression taken from this.) Next, a chunk of uncured gum rubber is squeezed against the

plastic matrix in a hot-platen press. The heat and pressure vulcanizes the gum rubber, curing what is actually a rubber reproduction of the original type or engraving. After curing, the die is trimmed, cemented on a sponge-rubber mount to provide cushioning and mounted on a block.

To make stamps at home, you follow this same basic procedure, but substitute readily available materials and improvised equipment for the stampmaker's special plastics, presses and molds. For a stamp of your name and address (or any

A RUBBER STAMP

other number and letter combination), go to a job printing shop and have them run off the copy on linotype slugs. You'll find that most such shops have a variety of type styles to select from, and the cost of having three or four lines set will be nominal.

To make a signature stamp, write your signature on a piece of bond tracing paper and glue this drawn-side-down on a linoleum block, which may be purchased at any art store. The signature will show through the paper in reverse, and with a steady hand and sharp knife, it's a simple job to cut away the background leaving the signature in relief, Fig. 3.

To take an impression in plastic from your original, clamp the slugs of type between two $\frac{7}{8}$ -in.-high wooden bearer strips with C-clamps. Next, saw a rectangular cutout a bit larger than your block of type in a piece of $\frac{1}{8}$ -in. hardboard, and glue this frame to a $\frac{3}{4}$ -in. plywood block. To make the plastic putty, add hardener to small amount of polyester resin, which is used to fiberglass boats. Mix in enough talc to give it a smooth, buttery consistency. Before taking the impression, brush both type and bearer strips with a parting agent sold for use with polyester, Fig. 2. Then fill the hardboard retaining frame with putty, Figs. 4 and 5, and work left-over putty into the face of the type with your fingertip to avoid entrapped air bubbles. Finally, press the plywood block down over the type until the putty-filled hardboard frame rests on the wooden bearer strips.

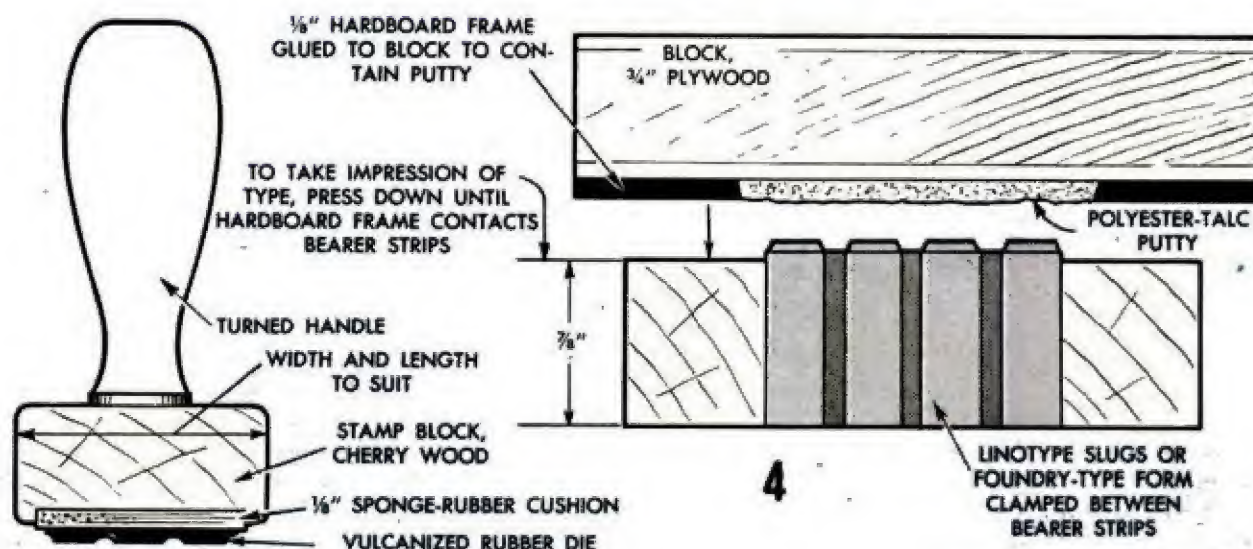
Allow at least 24 hrs. for the polyester to harden, then gently separate the metal

(Continued on page 190)



2. CLAMP TYPE SLUGS between $\frac{7}{8}$ -in.-high wooden bearer strips and paint them with a parting agent

3. FOR SIGNATURE stamp, cement pattern face down on linoleum block and cut away background





5. TO TAKE IMPRESSION, fill hardboard frame with polyester putty and press extra putty over type face



6. WHEN PUTTY HARDENS, gently remove type, sand face of matrix flush and wash with soap and water



7. CUT GUM RUBBER to approximate size of stamp, and place two layers over the talc-polyester matrix



8. AFTER CLAMPING metal plate and plywood backing block over gum rubber, cook this sandwich in oven

9. MOUNT CURED DIE on block over $\frac{1}{8}$ -in. sponge-rubber cushion, using a thin-bodied rubber adhesive

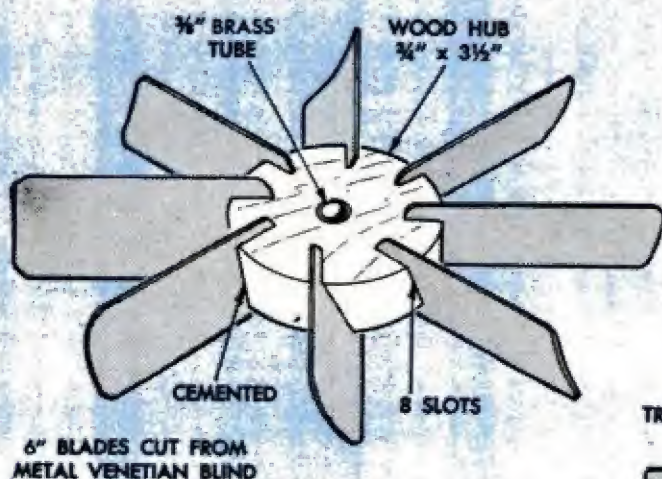


10. SIGNATURE STAMP does away with writer's cramp from signing Christmas cards, makes good gift

Quick Steps—No Form

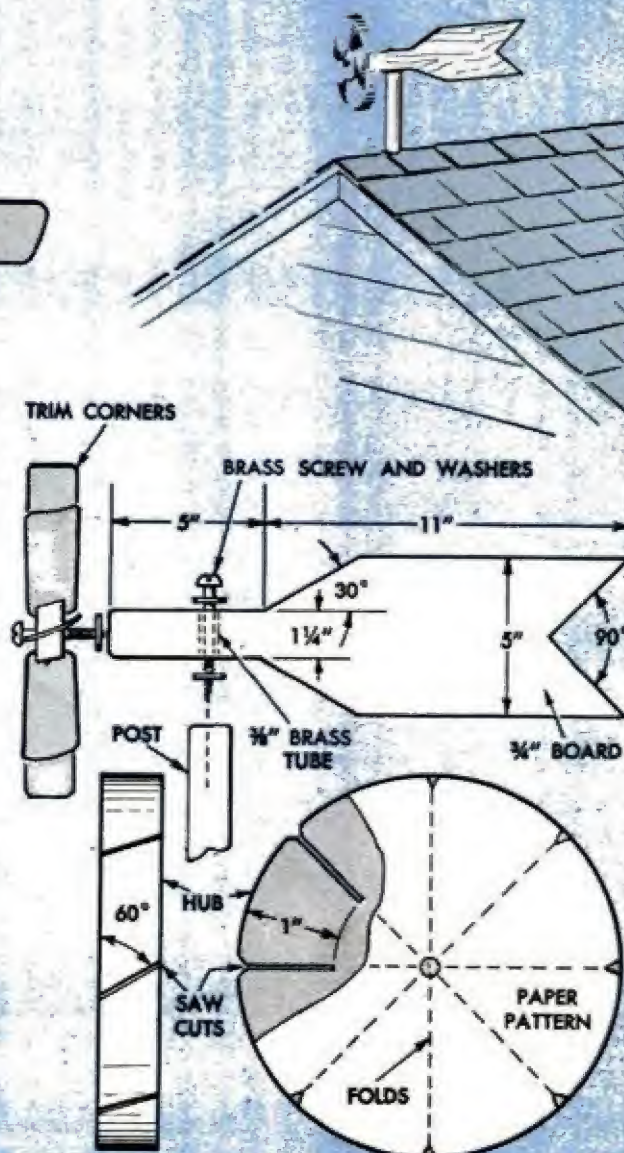
Do-it-yourselfers who like to climb fast when it comes to concrete-step construction on a terrace will find much in this method to recommend it. There are no forms to fit; no fill to bother with. Just remove the topsoil from the slope, dig out a dirt form on which to lay standard-size concrete blocks, place the blocks, level with sand or fine gravel and there you are—almost. Steps can be one or two blocks in width. One block makes a narrow but adequate flight; two blocks to each step, placed end to end, make a wide stair. See that the blocks are laid level and in the proper relation to form risers and treads of uniform height and width. Fill each hollow block with a sand-cement mortar (one-part cement to three-parts sharp sand, or buy it ready-mixed) and trowel smooth to a thickness of about 1 in. across the top of each block.

—Archibald Black



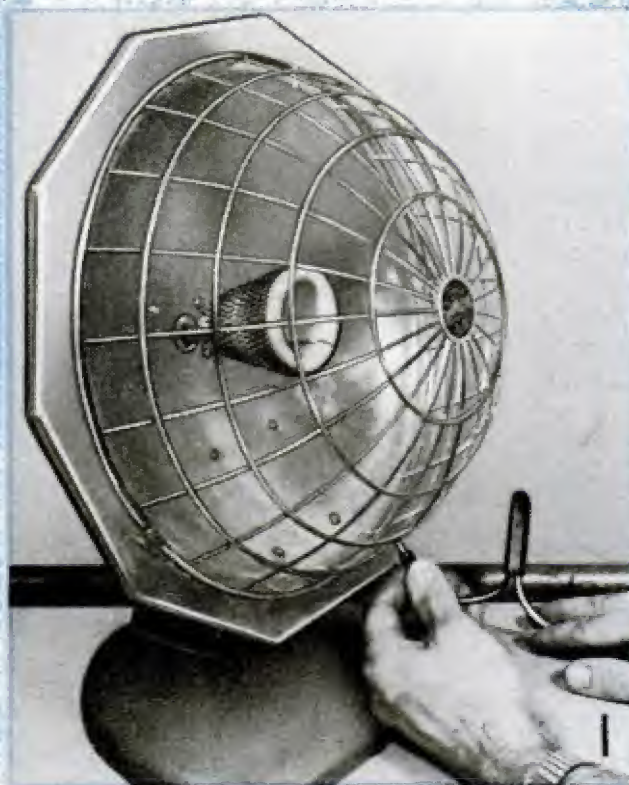
VENETIAN-BLIND WINDMILL

Got some metal slats from an old or shortened Venetian blind? Snipped into 6-in. lengths, they make ideal windmill blades. To space slots evenly around a wooden hub, fold a same-size paper pattern into a pie-wedge shape, flatten the pattern on the hub and mark off the fold lines. Cut the slots at a 60-deg. angle (a tilt-table jig or band saw speeds this job) and use water-proof cement to hold the blades in the slots and the brass-tube bearing in the center hole. Add a tail-board for an attractive weathervane—or hook the windmill up to an animated lawn ornament.—P. Casperson



ELECTRIC HEATER

Household



WHEN YOU HOP out of bed on a cold morning it's nice to snap a switch and feel the warmth from a small electric heater. But using an electric heater to take the chill from a small room can create a safety hazard if the heater develops a partial or complete internal ground. The slightest brush of a bare arm or leg against the heater frame could then produce a bad shock. In using such heaters you should always take these precautions: First, never handle the heater with wet hands or while touching any plumbing fixtures. Second, check the heater for possible grounds.

With the heater plugged in connect the leads of a test lamp between the heater frame and a known ground, such as a water pipe, Fig. 1. If the lamp lights, even faintly, it means trouble. Trace the electrical circuit from the plug end of the power cord, around through the heating coil and back to the plug. Any break in the cord insulation where the wiring could touch the heater frame, as in Fig. 2, is a source of danger.



Appliance Fix-It File

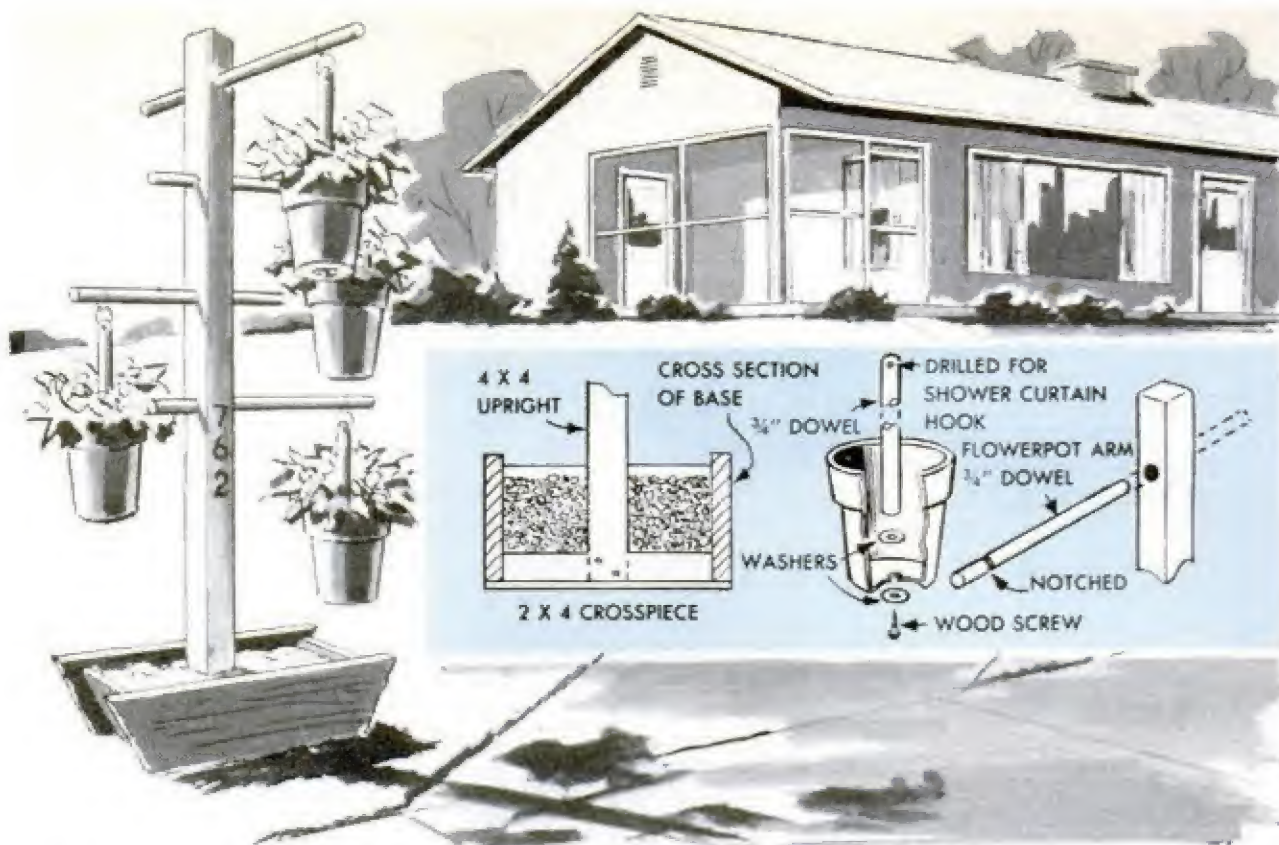
Heating elements will eventually burn out. The resistance wire will also lose its heating efficiency as it gets old. When a burnout or lowering of efficiency is indicated, replace the element. First remove the protective wire guard at the front of the heater and then remove the screws which hold the element, Fig. 3. Loosen the terminal screws for the heating element and strip the resistance wire from the ceramic core as pictured in Fig. 4. Replace the old resistance wire with new wire obtainable at your local appliance repair center.

Though construction details vary with different heater models, the basic operating principle holds true for all such heaters. Careful inspection of the model at hand will enable you to carry out the replacement of new resistance wire or elements on any heater without much trouble.

Equally important to the efficiency of an electric heater is the shiny reflector behind the heating coil. If this becomes dull or corroded, either from age or other cause, it cannot do a good job of reflecting the heat produced by the heating element. While you have the wire cage removed from the front of the heater, it is a good time to polish the reflector with a soft cloth, as demonstrated in Fig. 5.

If the reflector has lost its high polish you might have to apply a fine-action metal cleaner to restore its brightness.—*John Pennington*





Solving HOME PROBLEMS



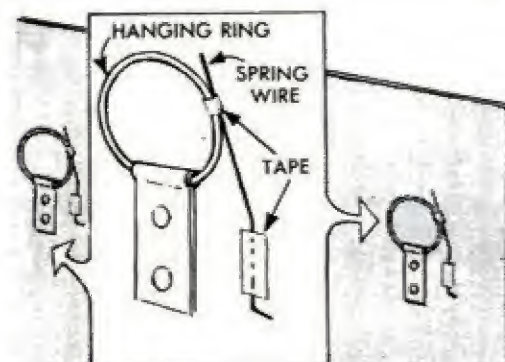
FLOWERPOT TREE provides a decorative yard planter for displaying house number. Height of the "tree" and size of gravel-filled wood base are determined by number and size of flower pots to be hung on dowels

CURTAIN ROD is easily made from a length of dowel and two cup hooks. Slip the curtain over the dowel and slide dowel into place on hooks. Twist the hooks to bear against dowel and prevent sliding off hooks

PLASTIC BAG worn over the hand while holding a shoe for polishing will keep hand clean. If preferred, wear the bag over your foot while polishing, instead of hand, thus avoiding getting polish on your sock.



HEAVY PICTURES or mirrors with two hanger rings at the back are more easily placed on wall hooks if the rings are held in outward position by spring wire supports. Wire is held with cellulose tape as shown





DRIP CATCH eliminates the messy condition that occurs when paint runs down the handle of a brush when in use. Simply tie a cloth around the handle. Put used rags in a metal container until burned.



STRAW HOLDER for a paper cup can be made by using the point of a pencil to punch a hole under the cup rim. Inserting the straw through the hole will make it easier for a child to manage the cup and straw



WHEN METAL TIP is lost from shoelace a wooden toothpick makes a quick emergency repair. Dip one end of the toothpick in glue, insert in end of shoelace and then break off the end to provide about $\frac{1}{2}$ -in. tip

WATER YOUR PLANTS with a dispenser made from an empty bleach jug. Drill small holes in cap and a larger hole in top side of the hollow handle. Thumb pressure over the hole creates a vacuum to control flow



SHOULDER SHIELD made from the top third of a dry cleaner's plastic bag prevents dust from settling on garment while hanging in closet. Tie bag neck to the hanger to facilitate quick removal of the garment

SCREW CAP of an empty 100-tablet aspirin bottle is the right size for measuring enough flavored powder to make an 8-oz. glass of beverage. Transfer the powder and label from its regular packet to the bottle



SHOP SHORT CUTS

Ball Anvil

Work in job shops often requires that the machinist know the exact wall thickness of tubing. Although stock specifications usually give this as inside and outside (I.D. and O.D.) diameter, if a light cut has been made inside or outside it still may be necessary to know the precise thickness of the wall. You can take this measurement with an ordinary mike by taping a steel ball to the anvil with cellophane tape. This serves the purpose and when removed, the accuracy of the mike will not be affected.



Draw Nailing

You need to join two boards edge to edge—no glue, no corrugated fasteners at hand. What to do? There are other ways, of course, but they take time, and time you haven't got. So you make use of an old, old trick—draw nailing, they called it. You butt the boards edge to edge and stand or kneel on each one to hold in position. You bend the tip end of the nail by catching it in the hammer claws as pictured, and then start and drive the nail at an angle as in the detail. Final driving home of the nail should be done with a nailset to avoid denting the surface with the hammer head.

—Bert Moon



Taper Fit

Perhaps you have thought about it, and again maybe not. At any rate you've never got around to grinding a slight taper on the four flats of the squared end of your chuck wrench. The squared end of the average chuck wrench is purposely sized to a fairly close fit in the socket head of the chuck screw. That means the wrench must be closely aligned with the screw before it will drop in place. Grinding a slight taper on the four flats will cause it to slip easily in place and will not in any way impair its efficiency.



Wire Stripper

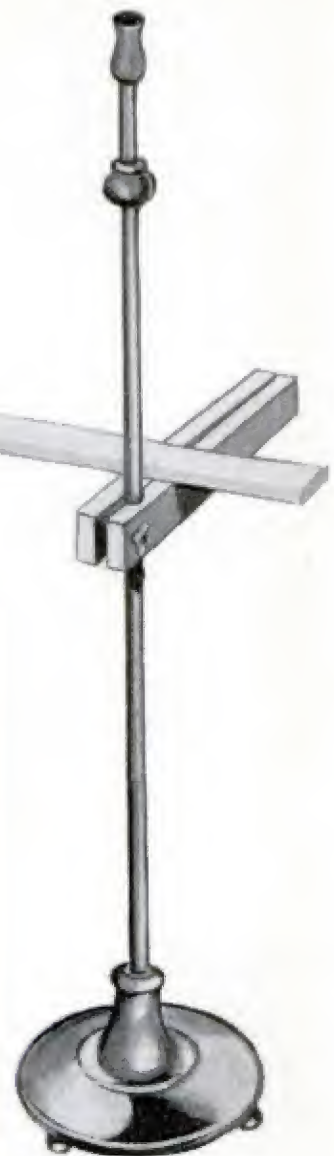
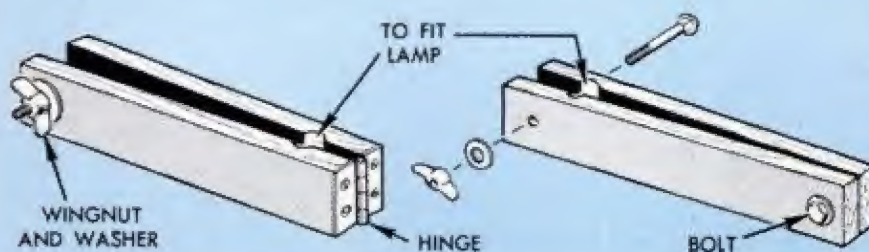
Rather than cut and pare insulation from wires with a pocket knife when making electrical connections use a battery clip as an emergency stripper. File the notched grippers, or jaws, of the clip to a sharp edge. Then just slip the opened clip over the wire, release the jaws and give the clip a slight twist. It will cut through the insulation cleanly. Then pull lightly on the clip and off comes the insulation, just as it would if you used wire strippers. Regular use of the clip is not impaired.





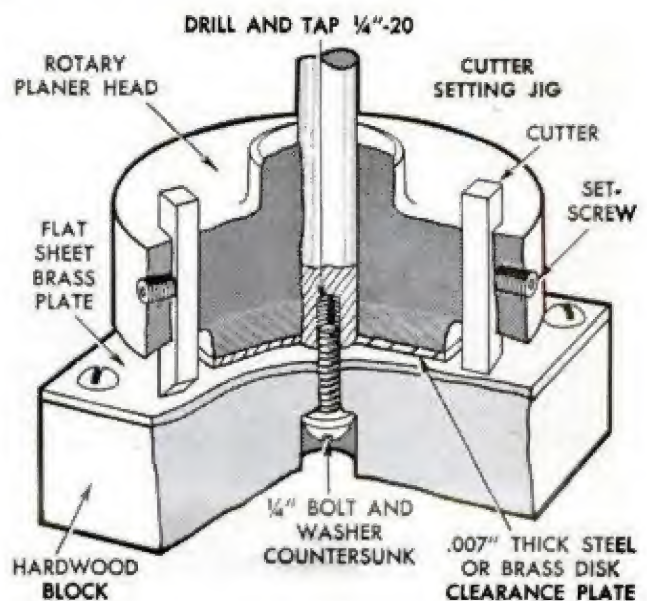
Floor-Lamp Work Support

DON'T THROW AWAY that old floor lamp. Remove the shade, add an adjustable clamp-on arm and you have a handy work support for your drillpress and other workshop tools. The clamp-on arm can be made in one of two ways, either by hinging or bolting as shown



Just-So Setting of Planer Cutters

If you've ever tried setting the cutters of a rotary-planer head without a jig, you know what a trick it is. Set one cutter too high and the other two are doing the work; too low and one is doing all the work. Either way the head is unbalanced and may vibrate at high speed. You can easily make a jig that will enable you to set all three cutters just so, every time. It consists of a hardwood block slightly larger in the square than the diameter of the head. Screw a piece of brass, 16 gauge will do, to one face of the block and center a counterbored hole through both block and brass facing for a 1/4-in. machine screw. Drill and tap a hole at the center of the head for the screw. Set the planer head on the jig, insert the screw and tighten it. Then you can set the three sharpened cutters at precisely the same depth.—*E. R. LeSage*





Helper Weights

When you use your drill press for a routing job your problem is to hold the work in position, feed the router bit into the work and lock the spindle at the correct depth, three things to do simultaneously. That's when, if ever, you need that third hand. One way is to unscrew the feed handle and slide two small weights over it as pictured. The weights can be cast-iron pulleys, large shaft collars—anything with a hole through the center. Just preset the spindle for depth and lower the handle. The weights will hold the spindle at the preset depth.—*Richard Hanscom*

Single-Throw Clamp

Here's a new use for the blade clamp, or chip breaker, from your hand plane. It makes a handy quick-acting clamp for holding small parts. Center a $\frac{1}{4}$ -in. hole through a piece of $\frac{1}{2}$ -in. hardwood, insert a $\frac{1}{4}$ -in. carriage bolt and drive it in tight. Then drop the clamp over the bolt and provide a washer and wingnut. To use, adjust the wingnut so that the work will just slide under the wide end of the blade clamp. Then snap the cam lever down to hold the work securely. Pull up the cam lever to release.



SPINDLE-SANDER IN AN EVENING

Need a sander for your shop? This one beats hand sanding all hollow when it comes to smoothing the curved edges of scroll work and other irregular work and it can be made for a song if you should happen to have a $\frac{1}{4}$ -hp. motor lying around.

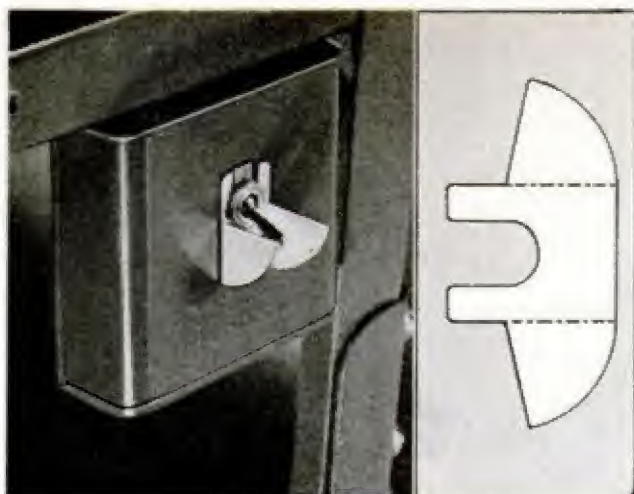
A glance at the details on the opposite page shows you how it's made. The motor is mounted vertically by substituting steel rods threaded at each end for the long bolts that normally hold the motor-end shields in place. The threaded upper-ends of the rods (upper when motor is in vertical position) pass through holes drilled in the horizontal plywood member, and also through holes drilled in a steel plate. Note how the nuts are run on the upper ends of the rods to space the motor from its support and to adjust it for height. Note also that the rods serve as bolts holding the motor-end shields.

The sanding drum can be any desired diameter and should be of the type having a tapped hub which will screw onto a threaded motor arbor.

The motor support is simply an open box of plywood which is screwed to a base of the same material. The motor support carries two slotted members which are held in any desired position by carriage bolts and wingnuts. The table is attached to these members by corner irons and screws. This permits adjusting the table for height, allowing use of all the abrasive area of the sanding drum.—*John Burroughs*

TABLE can be raised and swung out of the way for free-hand sanding. Note open-end slots in supports





SHOP SHORT CUTS

On Guard

There are switch guards and switch guards but this one does two things—prevents the switch from being turned on accidentally and makes it easy to bat the handle to the off position in an emergency. You make and fit it to suit the switch, using a piece of sheet metal. Simply cut it to the shape indicated and bend on the dotted lines. Mount the guard so that the switch handle will snap to the off position when it is at a point just above the wings.



Self Feeder

By fitting a strong spring between the rollers and the frame on the adjusting screw of a tubing cutter, you get an automatic, uniform feed of the cutter at each turn. Make sure there's at least 1/16 in. endplay between the roller casting and the shoulder of the adjusting screw. If there is not this amount of endplay, remove one screw which holds the roller casting and file down the shoulder of the adjusting screw. Then fit the spring over the screw as pictured. In cutting, start the cut, and tighten the screw. The spring saves advancing the screw with each turn.



Tubing Splint

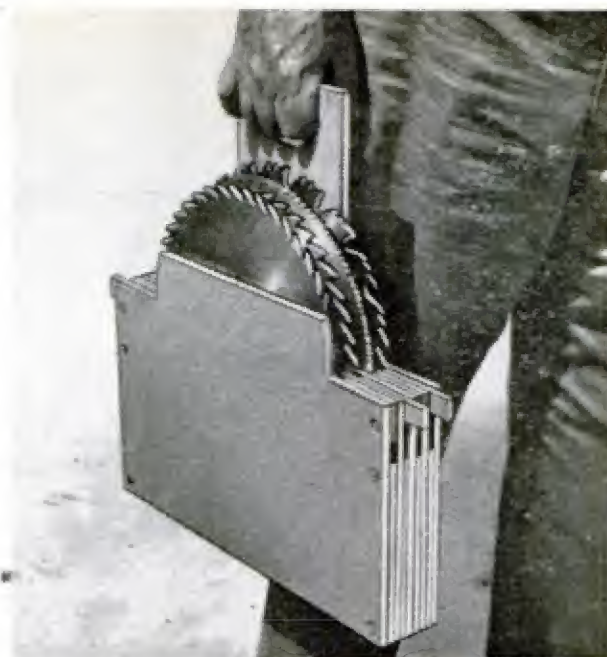
In butt welding or brazing two pieces of tubing end-to-end the main problem is to hold the two parts butted and in line. An easy way to do this is to cut three or four lengths of drill rod, all from the same piece, and then obtain two hose clamps of the type that tighten with a thumbscrew and worm. Slip the hose clamps over the ends of the tubes, butt together and then place the rods across the joint with the ends under the hose clamps. Space the rods, tighten the clamps and you're in line.

—H. J. Gerber



Drop by Drop

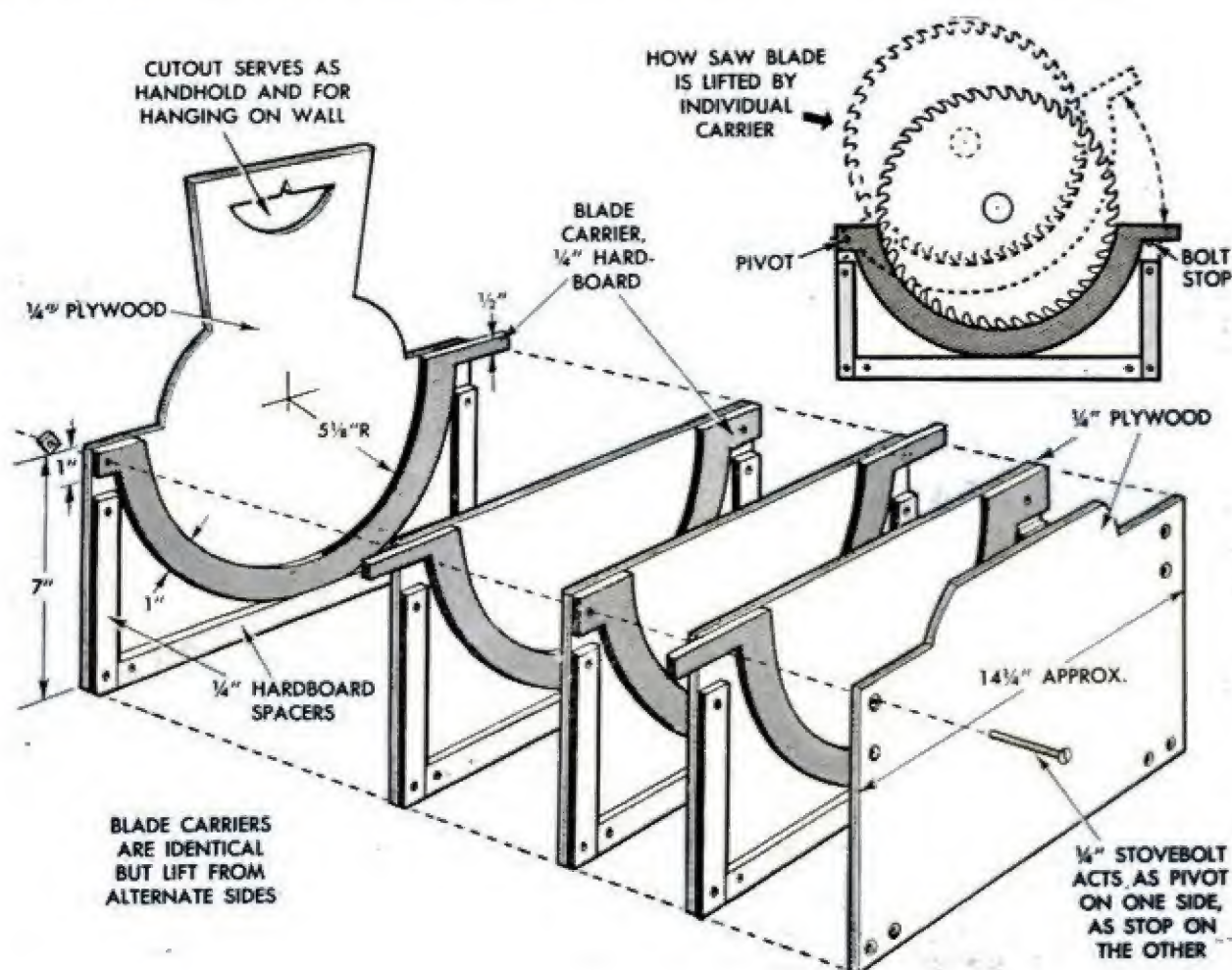
When turning steel or other metal free-hand such as you often have to do when turning ornamental shapes, a drop of oil applied occasionally gives the carbide tool a smoother, more uniform bite. Cutting lubricants, such as sulphurized oils, are best. Lard oil is a good substitute, but if neither is available, then use a light mineral oil, applying a drop at a time with a squirt can as pictured, or "painting" the work with oil with a small brush. The important thing is to keep the work wet with oil to provide lubrication at the cutting point and to dissipate excessive heat.



Circular Saw Blade Dispenser

HUNG ON THE WALL convenient to your circular saw, this storage-dispenser unit permits ready selection of the blade wanted, and provides a separate compartment for each blade to avoid dulling points by rubbing contact. Any blade can be lifted into position for easy removal without

danger of cutting your fingers on blades in the other compartments. The hanger-handle makes it a handy carrying case for taking blades to and from the sharpening shop. Add as many compartments as you need, cutting each blade carrier from $\frac{1}{4}$ -in. hardboard.—William G. Waggoner



FOR FAMILY FUN BUILD A TOBOGGGAN

By Manly Banister



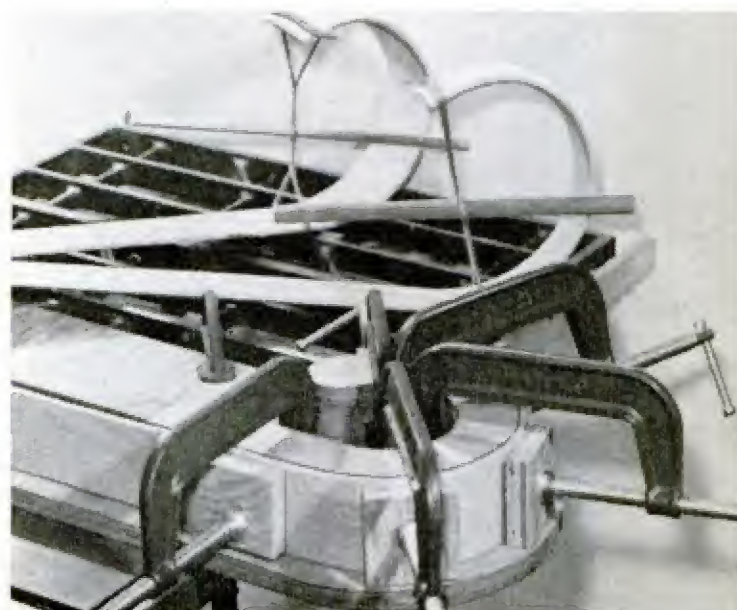
STACK-SAWING the bending caul can be done on a bandsaw or by hand, using common key hole saw

AFTER RESAWING the stock, sand the slats and runners to remove saw marks. Keep thickness uniform





LAUGH AT THIS SETUP if you like but it can do the bending job required on the toboggan slats and runners. Both need to be boiled from 1½ to 2 hours



SLAT (OR RUNNER) clamped in place on bending caul. Note position of clamps, also the finished bends

NEW, FREE-CUTTING WOOD RASPS speed up the job of making crossbars. Use white oak or ash for the bars

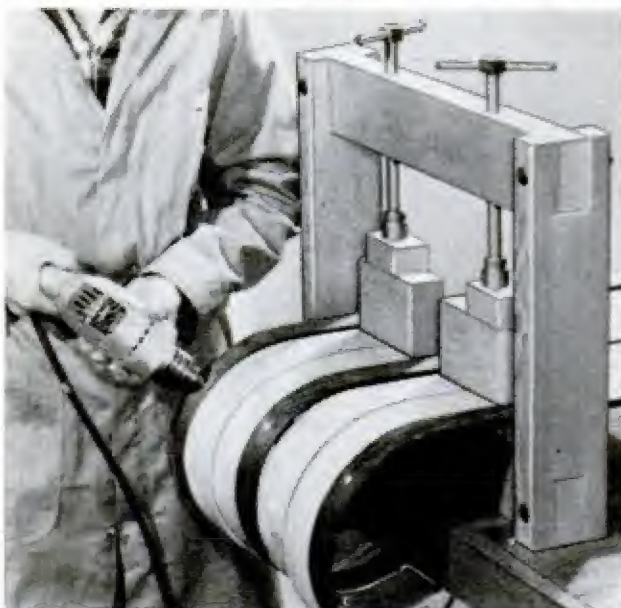


THERE'S NOTHING LIKE a toboggan for family fun. Large enough for several members to climb aboard, a toboggan lets mom, dad and the kids participate in a winter sport as a group and brings about a togetherness which youngsters truly enjoy. Unlike a sled with runners, a toboggan rides the top of the snow with lightning speed and the added weight of four or five only seems to make it go faster.

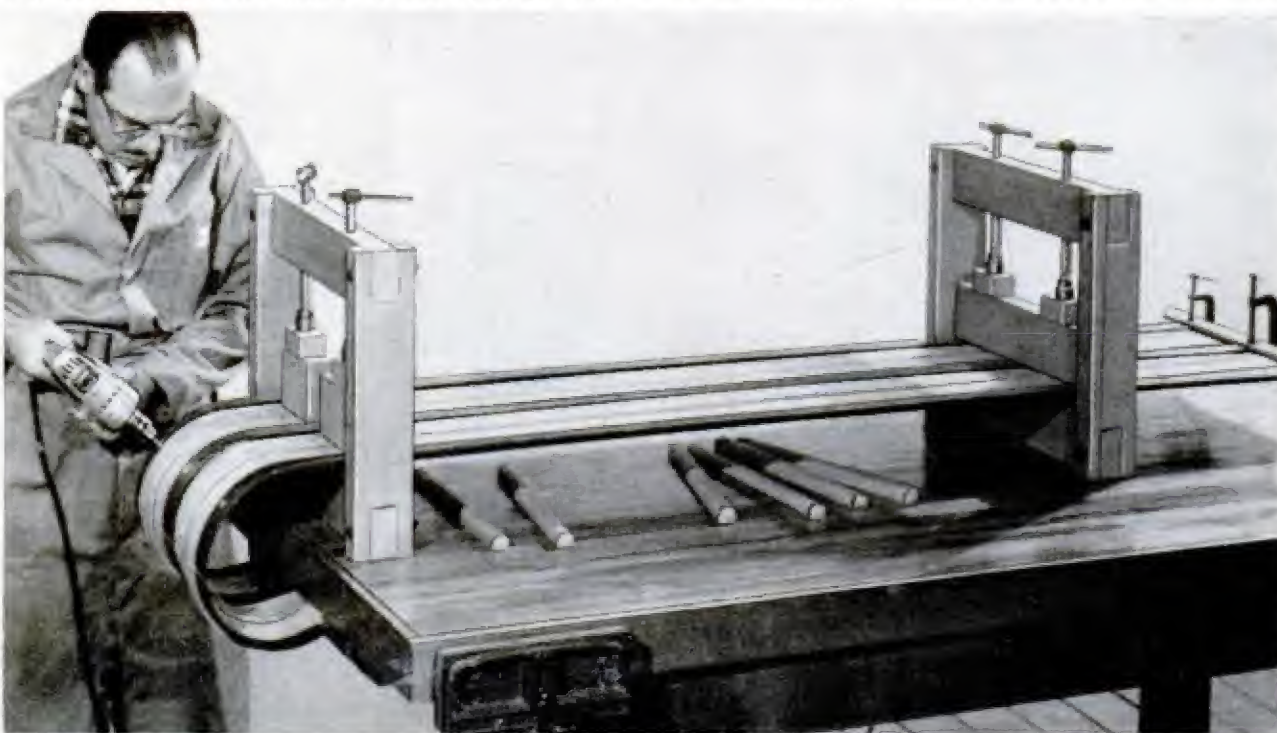
Fun actually starts with the building of the toboggan since it involves the interesting job of bending wood. Here the ends of



ROUNDING OVER edges of slats and runners is quickly done with a router-shaper, or with sanding block



DRILL and countersink holes for screws holding the crossbars. Screw heads should be slightly below flush



the four slats and three runners are first made pliable by boiling in water and then bending and clamping around a jig to dry. After the slats and runners are bent, it's a simple job of fastening them side by side to crossbars which in turn carry the stirrups which anchor the grab ropes. As for length, your toboggan can be made whatever length you wish—remembering that when it comes to carrying, it is as far back up the hill as it is down.

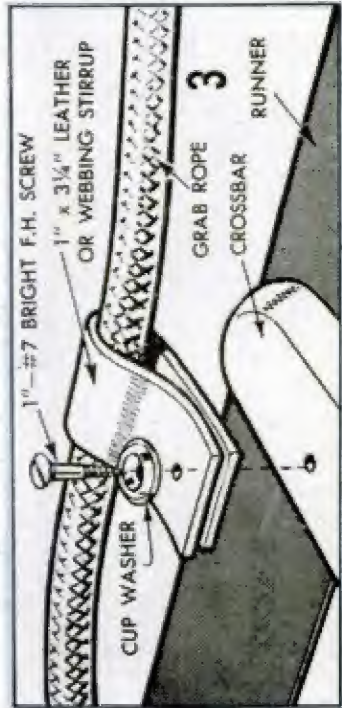
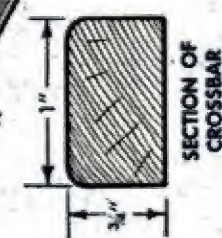
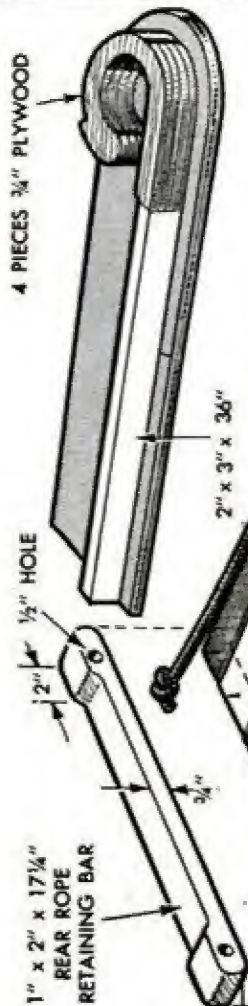
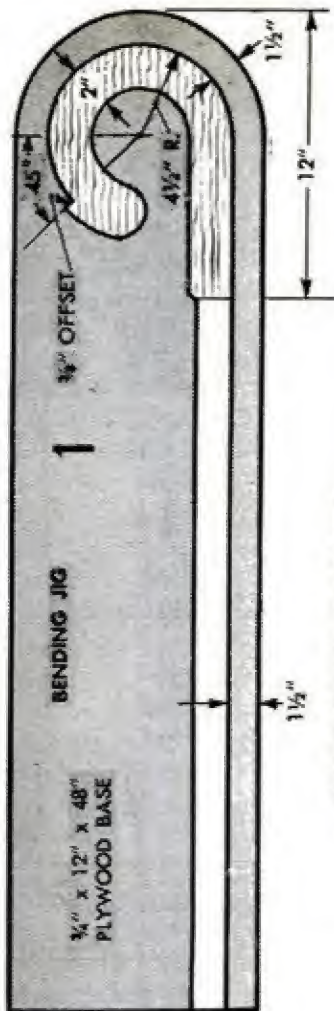
Bending Jig

Before you do any boiling and bending, however you'll need a bending caul, or jig, made from a 2 x 3 and four pieces of $\frac{3}{4}$ -in. plywood as in Fig. 1. Cut the plywood pieces oversize, stack them with glue on the joining faces and when dry, saw to contour as shown in the lower left-hand photo on page 172. The surfaces that take the slats and runners should be sanded to fine smoothness. Then assemble by screwing the two members to a $\frac{3}{4}$ -in. plywood base as in Fig. 1, making sure that the 2 x 3 is lined up with the straight extension of the plywood caul. Now, note the difference in thickness between the runners and slats and that the runners are tapered from $\frac{3}{8}$ to $\frac{3}{16}$ in. at the ends that are to be bent. Have these items as well as the crossbars, or cleats, made and at hand. Use white oak or ash for crossbars, Fig. 2. With all this done, you're ready for bending.

White ash is also the best wood for both the slats and runners. You need three runners and four slats. The runners are $\frac{7}{16}$ in. thick; the slats $\frac{1}{4}$ in. Most dealers in

(Continued on page 194)

HERE'S CONVENIENT WAY of holding runners and slats for assembly. Veneer-press clamps are homemade



3/4"-#5 F.H. BRASS
SCREWS SECURING
RUNNERS AND SLATS
TO CROSSBARS,
COUNTERSUNK

1/4" x 3" x 89 1/2"
WHITE ASH SLATS

1" x 2" x 17 1/4"
FRONT ROPE
RETAINER BAR

SECTION OF
ROLL-EDGE
BINDER

1/2" HOLE

WATERPROOF
GLUE



Birds Away!

Those pesky starlings and other gregarious birds that persist in roosting in that big tree that spreads over your walk—what to do about 'em? Shooing does little good, but here's a way to scare the daylights out of 'em: Drill or punch small holes near the tops of several tin cans, attach wire bails and string on a wire about 12 ft. long. Space the cans about a foot apart and kink the wire at these points to hold the cans in place. Put two or three marble-size pebbles in each can and suspend the whole thing between two branches. Attach a pull wire or cord long enough to reach handily from the ground. When the birds have settled for the night sneak up and give the pull wire a few sharp jerks. The racket will banish every bird from the tree for good.—*Blythe Decker*



Score First

When you need to make a box from cardboard for some special purpose, don't try to make a straight fold in cardboard or corrugated board. You just can't do it. Rather, first score the board along the line of the fold with a letter opener or the back of a table knife. Don't cut through the board or into the surface; just score a shallow depression on the pattern line. The board will fold perfectly.—*Michael Ligocki*



Paint Saver

When painting wooden fence pickets—a tedious, thankless job at best—the lid of the paint pail can serve a dual purpose. Just place it, inside up, under each picket as you go along. It will keep your brush free from dirt and grass clippings and catch any paint that drips from the brush or picket while you're painting. Occasionally you pull the lid out from under the pickets and clean up any drips that accumulate on the lid with a sweep or two of the brush. Result: No waste and no unsightly paint drips on the ground or grass at the lower ends of the pickets.—*G. E. Hendrickson*



Stain-Wax Finish

You can do a modern stain-wax finish on small surfaces by using shoe polish of the colored paste-wax type. First, do a very thorough job of sanding, producing as smooth a surface as possible, as a wax finish will show up every slight imperfection. Then apply the wax in the color desired as it comes from the container. Keep applying and rubbing until the wax builds uniformly on the surface. Then allow to dry and polish in the regular way.—*Richard Hanscom*

FARM TIMESAVERS

Dutch Door

Ventilation and shade are two essentials rather difficult to build into portable farrowing houses of conventional types. One hog raiser solves the problem in the fashion pictured. He builds a modified dutch-type door, the lower half being hinged to swing horizontally while the upper half is hinged at the top, swings upward and is held in the open position by two pivoted props. The lower end of each prop is slotted to drop over the projecting end of a lagscrew turned into a hole in the stud. As will be noted from the illustration, the upper half door is larger than the lower and covers an additional opening on each side of the door opening.



Hose Tunnel

Hydraulic hose connecting the tractor to the trailer hoist requires protective storage when not in use. To avoid having to disconnect, coil and store the hose separately each time after use, one farmer attached a length of pipe to the side of the trailer bed. Then he bent one end of a length of heavy wire to a U-shape and welded it to the upper end of the pipe. To store the hose it is fed into the pipe and caught in the U-shaped, friction clamp.



Stem Guard

Hogs, when they aren't scrambling for whatever feed is immediately available, delight in biting off unprotected valve stems of any rubber-tired trailers that may be parked in the feedlot. One sure way to prevent this kind of pig vandalism is to bend a U-shape from $\frac{1}{4}$ or $\frac{5}{16}$ -in. steel rod and weld to the wheel rim as pictured. Be sure, of course, that you allow enough space inside the U-shape to back off the valve cap and reach the valve with the air hose when inflating the tire.



Flip Top

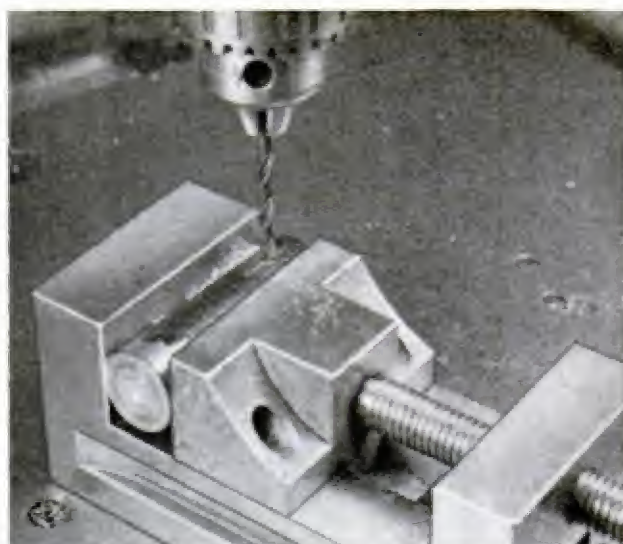
No turkey can walk the length of this feed trough or perch above it as turkeys and other barnyard fowl are wont to do. The reason is the rust-proof reel you see pictured just above the trough. It's sturdy, made by welding rings cut from discarded 4-in. well casing to three $\frac{3}{8}$ -in.-diameter steel rods. The reel thus made is assembled in sections, the ends of each section being supported by two posts which in turn support a wide ring cut from 6-in. well casing. The ends of the sections turn in the wider rings.—A. M. Wettach



One-Minute Layout for Diametral Holes



There are several methods of making accurate layouts for drilling diametral, or transverse, holes through round stock. But here's a way to do it in less than 60 seconds flat. It's accurate, too. Grip the work in a drill-press vise, then set a pair of "morphy" (hermaphrodite) dividers to slightly less than half the known diameter of the work. Set the hooked leg of the dividers against one vise jaw and scribe a line on the stock as in the left-hand photo. Flip the dividers over with the curved leg bearing against the opposite vise jaw and scribe a second line parallel with the first. Then center the hole between the two scribed lines and center-punch to start the drill. If the hole is small relative to the diameter of the stock, then you generally can go through with the given drill size,



as in the right-hand photo. But if the hole is to be relatively large, then you will generally find it best to drill a pilot hole first, using a small-diameter drill bit. The pilot hole will hold the larger drill bit true, preventing any tendency to wander off center due to the curvature of the stock. A cutting oil, such as lard oil, is a real help when drilling in round stock.—H. J. Gerber

WRITE FOR POPULAR MECHANICS

Readers are paid cash for ideas printed on these pages. You, too, may know of a simpler, faster or better way to do some daily chore about the home, farm, office, shop or garage; an aid to amateur photographers, modelmakers, workshop fans, car owners, hobbyists and others. Just send a short but complete description of your idea, plus a sketch or photo, to Shop and Crafts Editor.

COMING UP NEXT...

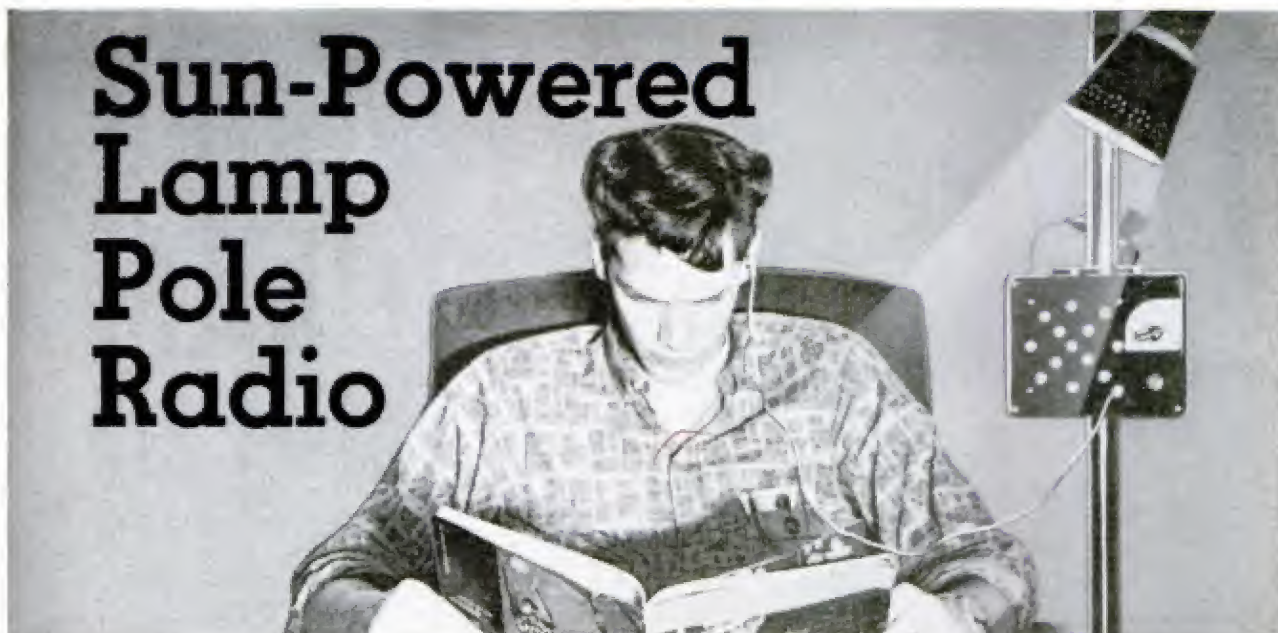
STEAM ENGINE. There's something fascinating about watching a model steam engine hissing and puffing away. This vertical-type one which is made without castings, runs on steam generated in a boiler assembled by screwing pipe caps to the ends of a pipe nipple. Engine and boiler are detailed separately in a two-part story beginning in the January issue.

SNOW BOAT. Looks like a boat, steers like a boat, but actually it's a sled midway between tot and teen size. Steers by means of a lever controlling twin rudders. Sheet-metal bottom skims packed snow. Just in time for fun galore on slick hills.

OVERLOADED ELECTRICALLY? A blown fuse in your home is like a fever in your body. It's a warning that something is wrong and not to be ignored. Chances are you've plugged-in more appliances than the circuit will handle. How can you check? Play it safe and read "Is Your Wiring Overloaded?" in the January issue.

WORKING WITH MARBLE. Restoring an antique table is easy enough but what about one with a marble top? How do you polish marble? How do you get rid of bad stains? How do you glue a broken top together again? You'll find the answers in a craft feature you won't want to miss in the January issue.

Sun-Powered Lamp Pole Radio



LIGHT MUSIC is what you get when the pole lamp and solar cells get together. No batteries are needed

HERE'S A TRANSISTOR RADIO that solves many problems. It uses earphones so that blaring music, sports announcing and other noisy programming you may prefer need not grate on family nerves. It generates its own electricity from ordinary light sources. Hence, no batteries are needed and costs are minimized. You can build it easily, at a cost of less than ten dollars.

Following the diagrams, lay out the parts on a perforated board. You will have to wind coil L2 yourself, but there's an easy way to do it. Start by tying one end of the Litz wire loosely to a door knob. Back away with the other end until the wire is fully extended. If you haven't enough room, you can start by tying the wire at its middle.

SPEAKER HOLES are for ventilation only. The set operates with an earphone, jack is left of volume



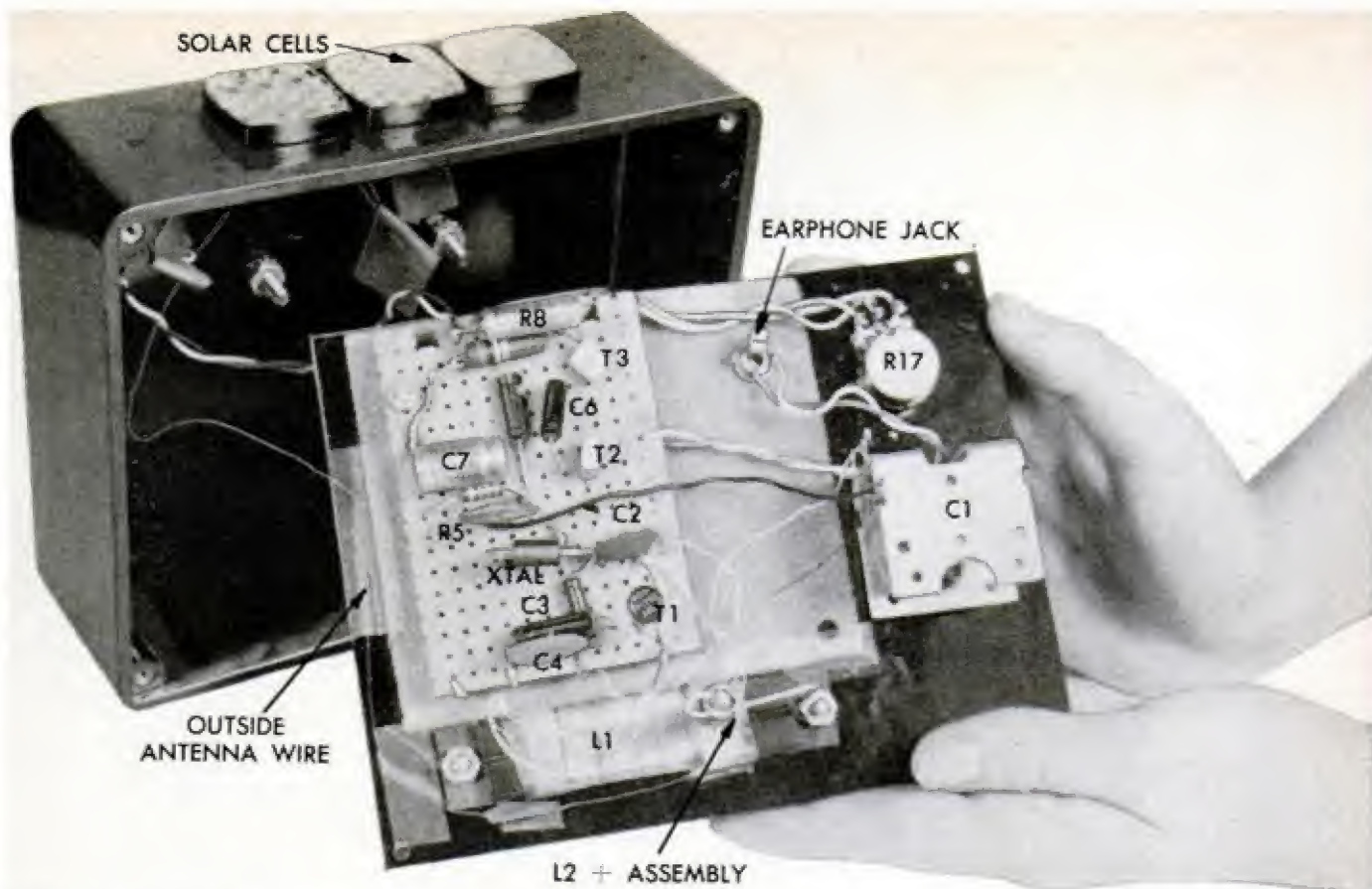
Apply a drop of fast drying cement, such as Polystyrene radio cement to the Ferrite core. Now, leaving some wire loose for later connections, cement one end of the wire to the core. When this has hardened, pull the core and wire taut, and start winding. As you wind the wire, move slowly toward the door. This will keep the wire taut and will produce a properly wound coil. Continue to apply the cement as you wind, so the coil can't unravel.

After bolting L1 in place, adjust the position of L2 while the set is operating, so that the entire broadcast range is covered.

The set is attached to the pole lamp by means of a small bracket. Place the radio at least a foot from the bulb, and adjust it up or down while listening for maximum volume. You will find that a 60 watt light bulb is ample to operate the radio. If you have L1 and L2 mounted too closely together, a squealing "feedback" will result. Should this happen, simply move the coils further apart until the squeal disappears and the stations come in again.

You can improve the reception considerably by using an additional antenna wire. While a good outside antenna at least 50 feet long is recommended, you may be able to get adequate reception simply by clipping the antenna lead to bare metal on the lamp pole. Be sure, however, that all lacquer is removed before attempting to make such a connection.

Since the radio operates with sun "bat-



PARTS PLACEMENT is clearly shown above. Follow the layout carefully. Schematic diagram is shown below.

series" or solar cells (these are silicon type, though any kind will work) you can use any white light source to make it work.

When wiring the unit, be sure to observe the polarity of the capacitors. Make sure the + is connected where it should be and not to the - terminal.—Homer L. Davidson

PARTS LIST

C1	365 mmf var. capacitor MS214
C2	.005 mfd ceramic discs C601
C3—C6—C9	2 mfd miniature electrolytic CF100
C4—C5	.01 mfd ceramic disc C601
C7	100 mfd 6 volt elec. CF106
C8—C10	30 mfd 6 volt elec. CF104
R1—R4	15 k ohm fixed resistors 1/4 watt
R2	470 ohm fixed resistors 1/4 watt
R3	22K ohm fixed resistors 1/4 watt
R5	47K ohm fixed resistors 1/4 watt
R6	2.7K ohm fixed resistors 1/4 watt
R7	10K volume control VC34
R8	100K ohm fixed resistor 1/4 watt
R9	280 ohm fixed resistor 1/4 watt
R10	4.7 ohm fixed resistor 1/4 watt
R11	10K ohm fixed resistor 1/4 watt
R12	68K ohm fixed resistor 1/4 watt
L1	Miller 2004 transistor antenna coil
L2	400T 5x44 Litz wire-WR417 1/4" ferrite form

Earphone—Argonne dynamic AR46 with earphone jack

XTAL—1N34 or equivalent

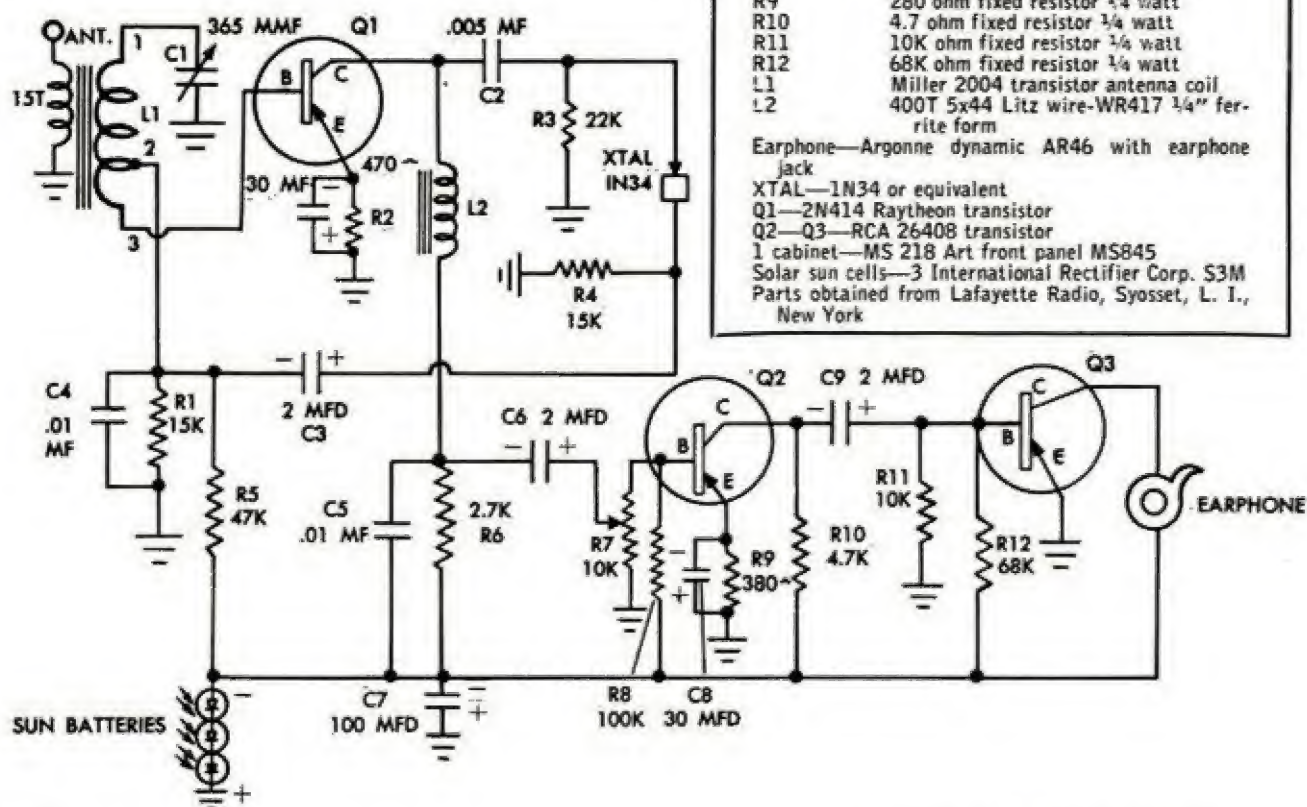
Q1—2N414 Raytheon transistor

Q2—Q3—RCA 26408 transistor

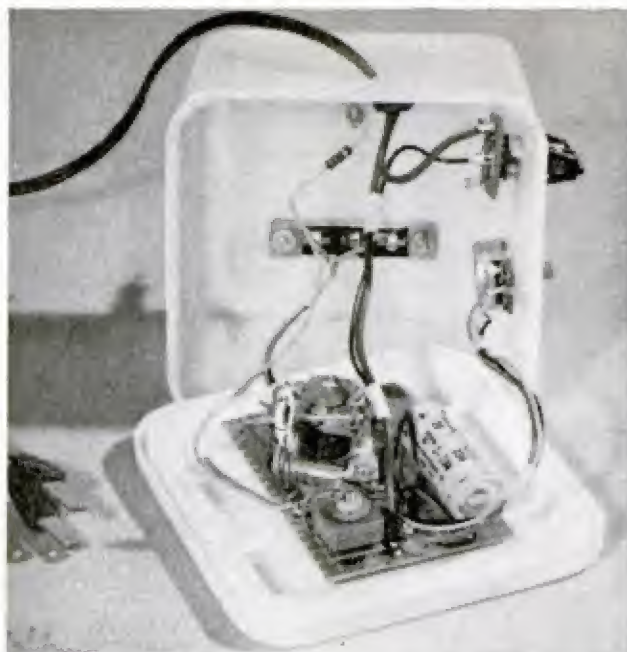
1 cabinet—MS 218 Art front panel MS845

Solar sun cells—3 International Rectifier Corp. S3M

Parts obtained from Lafayette Radio, Syosset, L. I., New York



TOUCHY SWITCH TRIGGER



PARTS PLACEMENT is not critical as sensitivity control adjusts bias. Terminal strip connects to relay

SWITCHGROPERs in the dark can now turn on the lights just by waving an appendage somewhere in the general vicinity of where a switch ought to be. It's as effective as a proximity fuse, and can be used in many applications. The trigger is a sensing antenna. When wired to a lamp, the antenna can be looped around the shade, for instance. A groper need only brush the wire while fumbling, and on goes the lamp. By running the sensing antenna around a window frame any unwelcome visitor using that mode of access to the house can be announced by sound or light alarm.

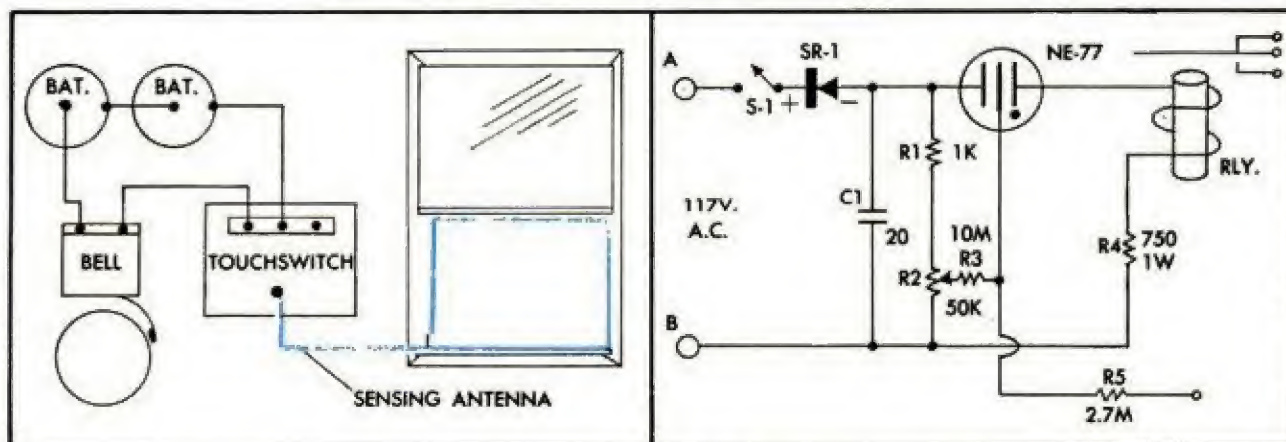


CLOSE RESET SWITCH (knob) and adjust sensitivity just below firing point. Touching closes relay

The touchswitch consists of 10 components and is easily assembled, as shown, in a standard wall switch box. No current is used until the switch is activated—if you like to save standby current. This is not a rehash of the old capacity switch. It operates on a little used principle. We all pick up 60 cycle current from the power lines that surround us. The sensitivity of the touchswitch is set until it almost fires the neon lamp. Touching the antenna applies enough of your built-in 60 cycles to the center electrode to fire the lamp and close the relay.

—John Potter Shields

WIRING DIAGRAM (left) shows typical application. Schematic diagram (right) shows simplicity of circuit

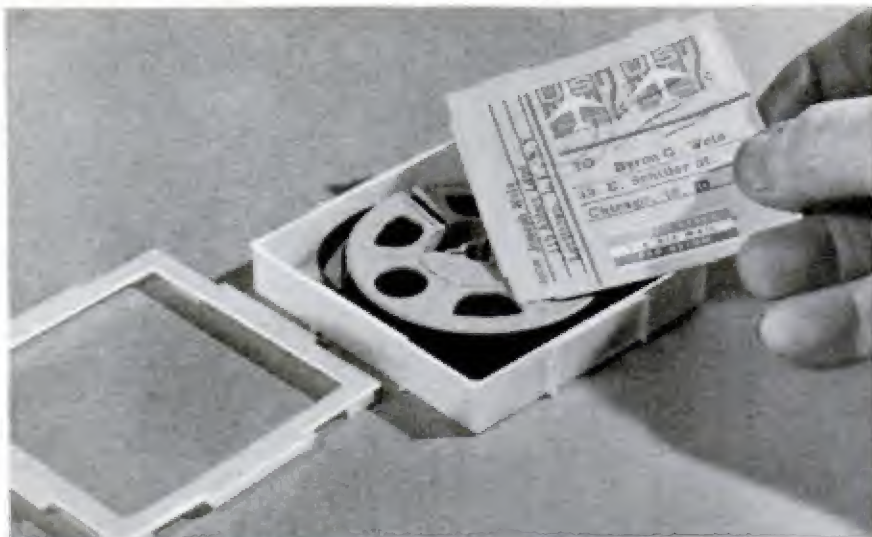


PARTS LIST

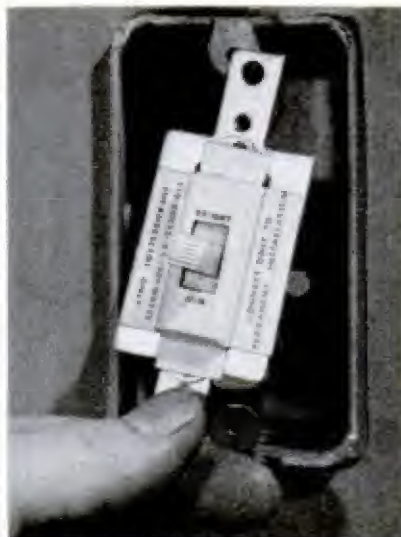
R1—1K, ½ watt carbon resistor
R2—50K ½ watt carbon potentiometer, linear taper
R3—10 megohm ½ watt carbon resistor
R4—750 ohm 1 watt carbon resistor
R5—2.7 megohm ½ watt carbon resistor

C1—20 mfd 150 volt tubular electrolytic capacitor (Olson #C—138)
SR1—65 milliamperes selenium rectifier (Olson #RE-36)
RLY—relay, 2K coil, SPDT contacts (Olson #SW-186)
S1—SPST rotary switch
NE-77—NE-77 neon lamp

Electronically New



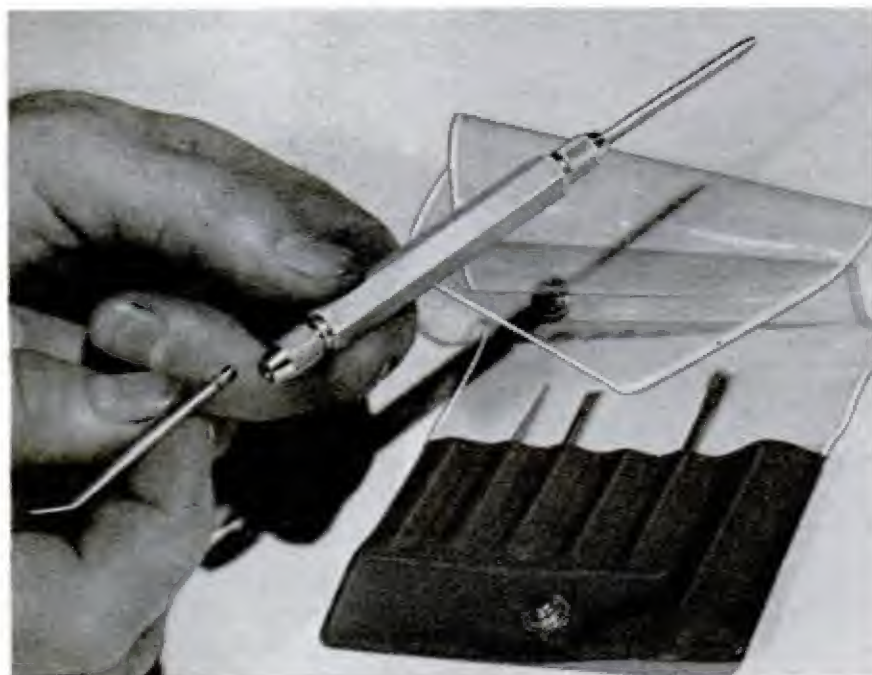
TAPE CORRESPONDENCE is facilitated by a permanent, impact resistant plastic box. The card insert is addressed on both sides, permitting the recipient to simply reverse the card and return the box with the answer tape. The plastic cover frame snaps off with a flick of the thumb nail. From 64c depending on tape length. Ferrodynamics Co., Lodi, New Jersey



SUBDUED LIGHTING is available without rewiring with Dim-A-Light. Reduces voltage 50%. \$3.95. Edco Corp., 19302 Grand River, Detroit, Michigan



TRANSPARENT INSULATION serves double function. In addition to picking up wall color, the inside wire is plainly visible. One lead is copper, the other tinned. Makes for easy polarization. \$2.95 per 200 feet. Olson Electronics, Inc., 260 S. Forge St., Akron, Ohio. A great convenience when hooking up loudspeakers in proper phase or wiring any DC electronic circuits



SOLDERING AID has replaceable tips for various jobs. Contains wooden handle with chuck at each end, five different tips. Complete with plastic bag, \$3. X-Acto Tools, Inc., 48-41 Van Dam St., Long Island City, N. Y. Set provides straight tip, a bent tip for angled work, split tip for de-wrapping wires, chisel tip for clipping and scraping, also stiff wire brush tip for removing any melted solder



HE'LL LOVE THE FLAVOR...AND EVERYONE WILL LOVE THE AROMA!

When Dad lights up a pipeful of HALF AND HALF, the people around him enjoy it almost as much as he does. That's because no other pipe tobacco has such a delightful aroma—and such a distinctive taste.

HALF AND HALF is a mixture of choice aromatic tobaccos . . . specially selected and blended for mild taste and friendly aroma. So this Christmas give your pipe smoker HALF AND HALF. Everyone enjoys the aroma.

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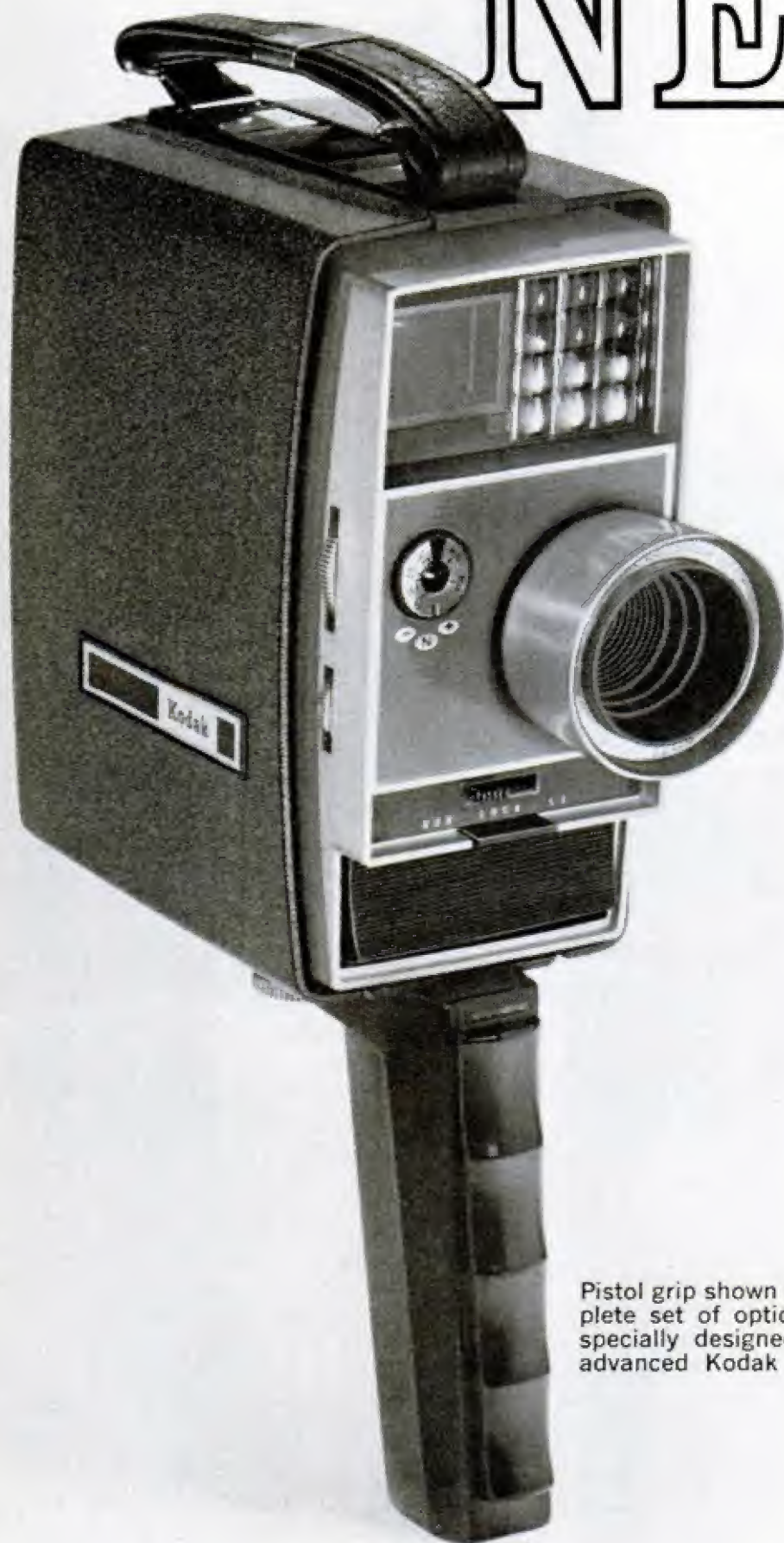
MEMO TO SANTAS!
Show this to your better half —
She'll love the aroma of
HALF AND HALF!

A CARGO OF CONTENTMENT IN THE BOWL OF ANY PIPE!

DECEMBER 1962

183

NEW!



Pistol grip shown is one of a complete set of optional movie aids specially designed for this new, advanced Kodak movie camera.

KODAK Electric 8 Automatic Camera



BATTERY-DRIVEN! No winding—ever. Four powerful manganese alkaline batteries—penlite size—drive the camera motor for you. You can keep shooting as long as action lasts with no chance of a scene-spoiling slowdown in power. One set of batteries will drive up to 10 rolls of film through camera. A signal in the viewfinder gives you long-range warning when batteries need replacing.



DROP-IN LOADING! New KODAK DUEX 8 Cassette speeds loading. You place regular 8mm roll film in the cassette in seconds. Drop cassette into the camera and it's loaded! When you finish the first side of the roll, just turn the cassette over to shoot the second side. (You can do it faster than a football team can huddle!) Pre-load several cassettes to film a whole game or other continuous action.

You're always ready for action!

The new KODAK Electric 8 Automatic Camera is ready to go the distance in any action. Ready to whirr into action as fast as you can put it to your eye.

No winding! It's battery-powered. No lens setting. An electric eye automatically adjusts the super-fast $f/1.6$ lens to the light.

For extra versatility you can lock the lens at any setting. Set the meter for intentional under- or overexposure for spe-

cial effects. A built-in filter lets you use the same roll of Type A KODACHROME Film indoors and outdoors.

Isn't this the kind of movie camera you've always wanted to own . . . a camera always ready to capture the action and color that's now passing you by? See it soon at your Kodak dealer's. Own it in time to save your Christmas in colorful movies! With hand strap, one cassette, less than \$100. Batteries extra.

Price subject to change without notice.

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

Enjoy Walt Disney's "Wonderful World of Color" Sunday evenings, NBC-TV

Kodak
TRADE MARK

CLINIC FOR HOMEOWNERS

Noisy Furnace

Q—*I have a forced, warm-air heating system which has been in operation five years. During the latter part of last year's heating season I began to notice, when the burner went on, a loud, snapping or cracking sound from the furnace. This fall I'm hearing the same thing. I had never heard the sound before it began last spring. Is this damaging? How can it be stopped?*—F.D., Mich.

A—You do not say but we are assuming that the furnace is gas-fired and that the heat exchanger is of sheet metal rather than cast iron. If these assumptions are correct, then the sound you hear is likely due to expansion of the metal in the exchanger, although it could originate in the plenum or elsewhere and still appear to be in the exchanger. No harm is likely to result, but, unfortunately, there is little, if anything, you can do to silence the annoying sound. The interval between burner cycles in the moderate weather of fall and spring allows the exchanger to cool to near room temperature before the burner kicks on again. The quick expansion of the exchanger causes it to give off the sounds you hear, but it is quite likely that as the heating season advances and the intervals between burner cycles shorten, the noise will be minimized and possibly eliminated altogether.

Cleaning Old Brass

Q—*I have an old brass kettle (I presume it is of the type used for making apple butter) on which I have spent many hours of effort trying to clean and polish both the outside and inside. I've used a number of different polishes without much effect. What to do now?*

—N.O., Conn.

A—Cleaning and polishing old brass, also copper and iron, is a seasonal problem of collectors. There just isn't any simple, easy way to clean and polish old brass, unless of course, you take the items to a shop equipped to handle this sort of thing. The shops clean the metal with power-driven wire wheels and polish with cloth buffs charged with an abrasive at a nominal cost. We'd recommend that you seek out such a shop in your locality and save yourself a lot of tedious work. But if you'd rather do the job yourself there are a number of good polishers available for hand application. But don't expect the

polish to remove the coatings you usually find on old brass, especially old kettles. You have to get down to the metal with a wire brush.

Mystery Leak

Q—*We live in an older home having a large inside chimney. In spring, summer and fall during and after a heavy rain-storm a damp spot appears on the wall in an upstairs bedroom. The chimney forms a part of this wall, the plaster apparently being applied over the chimney bricks. I've examined the flashing closely and there seems to be no signs of leakage here. The bricks need pointing but the cap seems to be perfect. Where else should I look?*—E.S., Kan.

A—There are several possibilities, but your mention of the chimney needing pointing, narrows them down to the good chance that the water from a driving storm enters the chimney flue through the bricks at some point above the roof. If the chimney has a tile liner (you did not say), then it is just possible that the water from above runs between the bricks to the liner and down the liner to that point where the damp spot shows on the wall. This is only a guess, of course, but it does seem a strong possibility.

Calk Expansion Joints

Q—*My concrete driveway is about 50 ft. long and consists of several slabs with expansion joints. During very cold weather these joints open so that the strips are loose. I've been advised to calk the joints but this does not seem to me to be the right thing to do. How about it?*

—P.N., Minn.

A—When the slabs expand during warmer weather it is likely that any calking compound would be forced out of the joints. The only reason for calking would be to keep out water which would freeze during cold weather. But if the driveway shows no signs of damage from this source and if the slabs are still level and not cracked, then we would see no reason to calk the joints as suggested.

As a service to Popular Mechanics readers in solving the hundreds of problems pertaining to a home—inside or out—you are invited to present your problems to The Clinic Editor for his helpful advice. Address your questions to The Clinic Editor, Popular Mechanics Magazine, 575 Lexington Ave., New York 22, N.Y.

GIFT SUGGESTIONS



For his "Horse" in the basement...

If woodworking gives him pleasure, give him Stanley Power Tools for Christmas. He'll get year-round pleasure from these quality tools . . . the heavy-duty H75 Sabre Saw (\$44.95) that cuts 2" planking —is perfect for scrolls, curves, cabinets, plastics, veneers; the new, low-cost H271 Power Saw (\$44.50) with Stanley "Motor Saver" drive and other quality features; and the H81S Drill Kit (\$43.25 value for only \$29.95), a sturdy, metal carrying case containing a Stanley H131 Drill, drill stand, 8 bits and every other needed drilling accessory. Drill, without kit and

accessories, is available at special price during the Christmas season.

See these quality Stanley Power Tools at your nearby hardware store and make your Christmas gift selections . . . sure to please.

STANLEY POWER TOOLS

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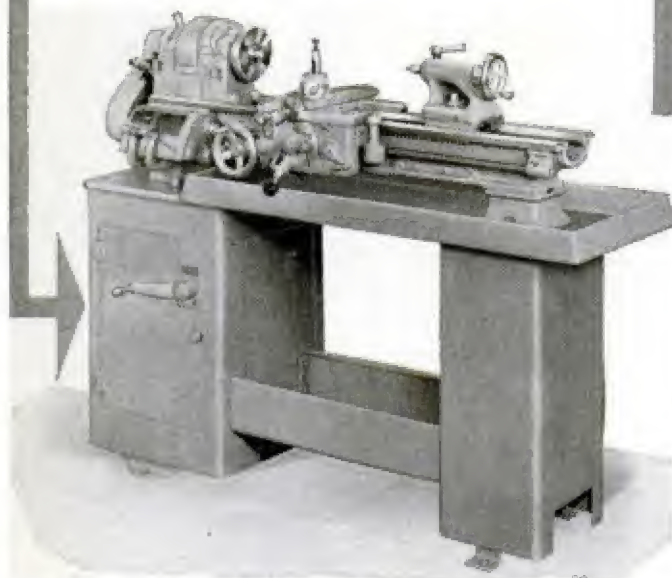
®

NEW BRITAIN, CONNECTICUT

South Bend

10" LATHES

*with new
welded steel
floor legs*



- New, trim floor legs . . . reinforced construction of welded, heavy gauge steel . . . maximum rigidity with minimum weight . . . no increase in price!
- Famous South Bend dependability.
- Superfinished spindles and bearings for uniform accuracy and fine finishes.
- 70 screw threads (4 to 480 per in.) . . . 70 longitudinal feeds . . . 70 cross feeds.
- Tool room and Engine Lathe models . . . prices start at \$1346 f.o.b. factory.

WRITE FOR CATALOG

*of South Bend Lathes, Milling Machines,
Shapers, Drill Presses and Pedestal Grinders*

SOUTH BEND LATHE, INC.

South Bend 22, Indiana

Building Better Tools Since 1906

Time payment plan
available. Up to 36
months to pay.



Bidding For Bargains

(Continued from page 100)

be made prior to the sale. This money is applied to purchases, and if nothing is bought, the deposit is returned at close of sale. All sales are by cash or certified check. To prevent carrying large sums of cash, where expensive purchases are contemplated, have certified checks made payable to yourself, and indorse them over at time of purchase.

Railroads, trucking lines and other shipping agencies hold periodic public sales, offering a variety of merchandise at extremely low prices. These items are acquired through damage in shipment, confiscation for lack of payment on shipping charges and unclaimed C.O.D. packages. The damages in most cases are scratches, water marks and blemishes that are easily repaired. An example of this is cases of canned foods that have been dented or the labels stained. Most commonly available are furniture, appliances and radio and TV sets. Information pertaining to these sales can be obtained from each agency.

Many people fail to investigate these auctions on the assumption that dealers with unlimited financial backing buy up anything worth having in large job lots. This is not necessarily true, particularly in Government sales. Dealers have no more rights or priority than other citizens, and they must enter their bids like any private citizen.

It is true that a dealer has an advantage in buying large shipments, but he seldom bids on single items, which are the prime interest of the individual bidder.

In addition to auctions being potential gold mines for bargains, you will find them a source of fun and excitement. It is a form of shopping that can become a fever, and once you try it, you will want to investigate all the private and government sources.

Plan New Portraits of Sun

Detailed radio pictures of the sun will be taken by a radio heliograph soon to be built in Australia. The instrument will consist of 100 saucer-shaped aerials, each 42 feet across, arranged in a circle two miles wide.

Its radio pictures are expected to give information about the giant explosions and storms that occur in the sun. These solar storms disrupt radio communications throughout the world and also produce cosmic rays that could endanger space travelers of the future.



*It's already tomorrow
on the other side of the world...*

*Hear the modern
pioneers in action!*

Hallicrafters World Range Radios bring the words and sounds of adventure into your living room direct—from a huge liner fog bound at sea to a giant bomber on Arctic patrol. Even America's Astronauts may be heard on some models!

*Your "listening post" for
hundreds of countries!*

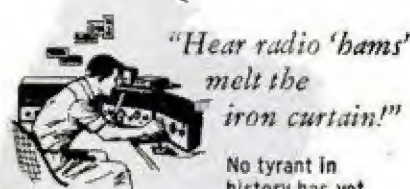


You're truly in tune with the whole world through your Hallicrafters. On-the-spot news broadcast in English from over 200 foreign stations... and there's nothing like the real thing for foreign language study!



Beautiful S-120 Hallicrafters World-Range Receiver—Standard Broadcast plus three short wave bands. Foreign, amateur, aviation, marine and emergency frequencies. Has "bandspread" for razor-sharp tuning of close-together stations.

*...and tonight, you can hear what's happening
on your Hallicrafters world range radio!*



No tyrant in history has yet been able to crush the free exchange of good will that occurs every day among the radio amateurs of the world. "Hams" (250,000 strong in the U.S.A. alone) are our first line of communication in time of disaster, too. Hear them on your Hallicrafters!

*S. O. S. !
S. O. S. !*



When emergency strikes, you may be on the scene with your Hallicrafters World Range radio. Marine... fire... police... civil defense channels... all at your fingertips.

Before you retire tonight, a new dawn of critical world events will begin in the major capitals and trouble spots around the globe.

Yet tonight, through Hallicrafters World Range Radio, tomorrow's history springs to life in your own home. While it is happening.

With a twist of a knob, you could be listening to Moscow one minute... Berlin... Africa or New Delhi the next. You tune easily through the decisive voices of varied world reaction and opinion—hundreds of English, as well as foreign language, broadcasts from the four corners of the earth.

Never before have you been so thoroughly informed. Never before have you grasped so quickly the full impact of momentous events. Or felt so much a part of them.



It's incredible...

what you'll hear on a

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Prices higher outside U.S.A.

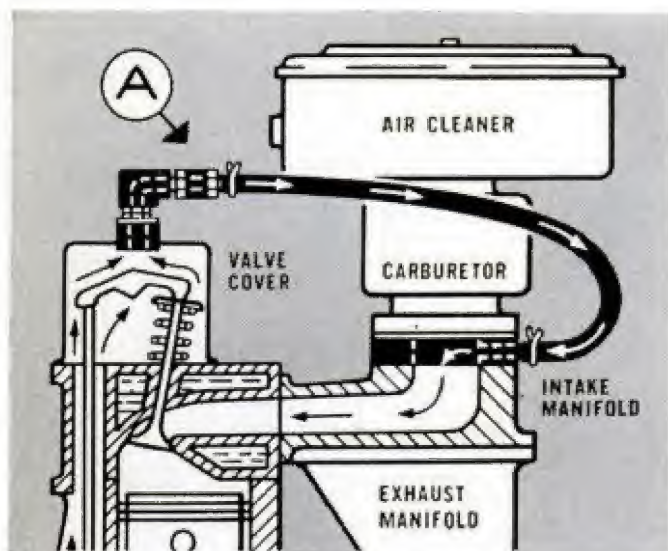
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DECEMBER 1962

189

Test your automotive I.Q!

QUICK QUIZ BY QUAKER STATE



1. What is this device (A)? What is its purpose?



2. What does this symbol stand for?

Pictured at top is an "anti-smog" type crankcase ventilator which prevents crankcase blow-by fumes from escaping to the atmosphere. The life preserver stands for Quaker State Motor Oil—because it is the best engine life preserver. Refined from 100% pure Pennsylvania Grade Crude Oil, it keeps your car on the road, out of the repair shop. Insist on Quaker State—the best engine life preserver.



QUAKER STATE OIL REFINING CORP., OIL CITY, PA.

RUBBER STAMP

(Continued from page 159)

type and pull it out of the plastic, Fig. 6. Sand off any excess polyester from the face of the hardboard frame, and wash the matrix with soap and water to remove any parting agent adhering in the impression.

Next, cut two pieces of inner-tube hot-patching gum (the uncured rubber a garageman uses to seal punctures), making these slightly larger than the impression in the matrix, Fig. 7. Position these two layers over the impression and cover with a piece of sized cambric or plastic-coated cloth to prevent sticking. Back this with a smooth metal plate, $\frac{1}{8}$ in. or thicker, and a $\frac{3}{4}$ -in. plywood clamping block. Squeeze this sandwich together with several C-clamps, Fig. 8, tightening them gradually and evenly to compress the gum rubber into the matrix. Then cook the whole thing in your kitchen oven for at least three hours at 250 deg., allowing the heat to penetrate both plywood and polyester and completely cure the gum rubber, Fig. 8. After cooking, set the sandwich aside to cool before releasing the clamps and peeling the vulcanized die from the matrix.

Stamps up to 5 in. wide generally are mounted on flat-bottomed blocks, Figs. 1 and 10. However, wider stamps will require a rocker-type block in order to make an even impression on the paper. You can buy the $\frac{1}{8}$ -in. sponge rubber for cushioning from a rubber goods supplier. To avoid lumps when mounting the die and cushion on the block, use a thin-bodied rubber adhesive, Fig. 9.

You can also use this stamp making technique to make special rubber grommets or gaskets which can't be obtained locally. Simply make a clay model of the part you need, take a polyester-putty mold from it, load the mold with gum rubber and vulcanize in the oven.

Electronic Space Welder

High-energy beams of electrons concentrated in a small area can be used for emergency welding repairs in outer space.

Since all of outer space is a near vacuum, the usual welding techniques requiring oxygen or heavy liquids are impractical.

The electron beam is a ray like form of high-speed electrons, according to Robert Bakish of Alloyd Electronics Corp.

He predicted that on future space flights structural components joined by electron beams will be part of the space vehicles. He said astronauts will be able to make repairs in space or on lunar bases.

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Now you can own a genuine **SCHAUER** 6&12 volt battery booster at a low, low price! The Model H612 is positively not just a battery "warmer", as are so many "economy" models on the market! It delivers a full 1 1/4 amps of power at BOTH voltages, that will charge car, boat, motorcycle and lawnmower batteries. Has full-wave Selenium rectifiers...automatic circuit breaker...6 or 12 volt selector switch...rugged steel case with handsome red finish. Money-back guarantee. Buy yours now. If your dealer can't supply, send check or money order.

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FREEDOM FROM WRONG TURNS!**



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SAYS:
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shortest days of
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Can Even Be Applied Under Water!



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HANDBOOK Catalog**

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Thousands in Use!
TRACTOR Since 1946

UNEQUALLED LOW PRICE! TERRIFIC VALUE!

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DECEMBER 1962

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"A real steal!"



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Falls-built motor. Ideal for cabi-
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and hobbyists. 4500 non-scratch-
ing orbits per minute.

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Full 1/2" stroke. Cuts all types of
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metal. Automatically blows saw-
dust from guide line. Cuts its
own hole without predrilling.
Powerful Millers Falls-built motor.

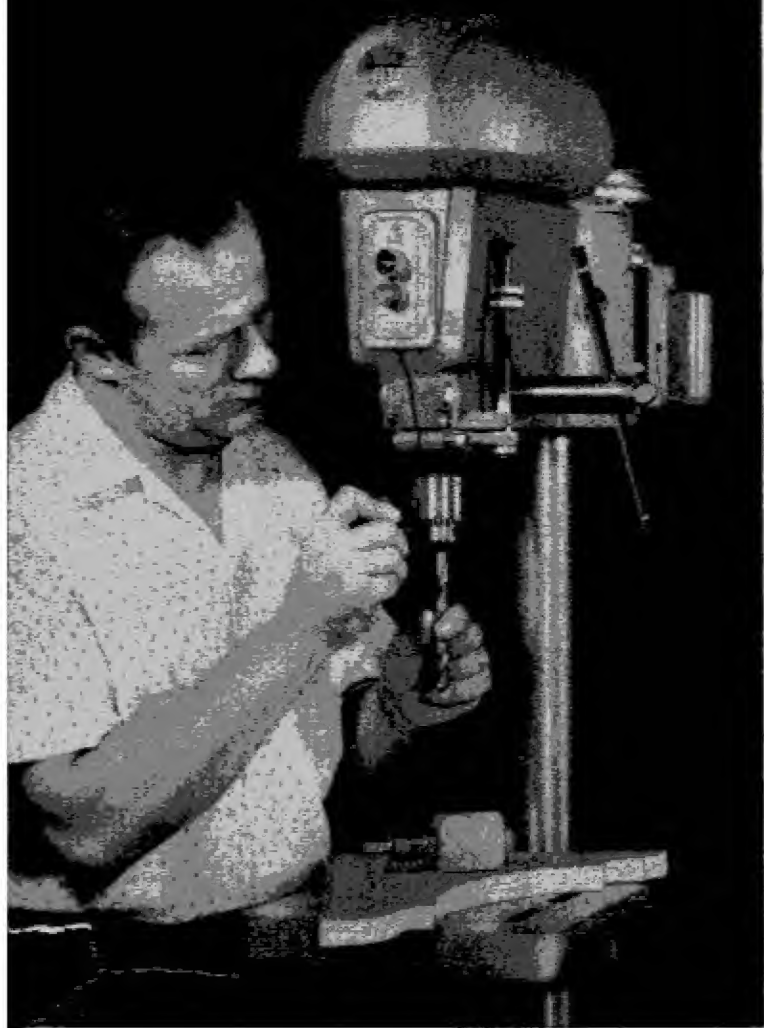
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- Husky 2" quill with 4 7/16" stroke
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- Dynamically balanced spindle pulley

Machine converts in seconds with any of six interchangeable spindle adapters to do dozens of jobs in wood, metal or plastic.

See this big value soon. Your Delta dealer is listed under MACHINERY in the Yellow Pages. For FREE BROCHURE with full details, write: Rockwell Manufacturing Company, Delta Power Tool Division, 502M N. Lexington Ave., Pittsburgh 8, Pennsylvania.

*Bench model less electricals

Rockwell
MANUFACTURING COMPANY



Christmas Cutouts

(Continued from page 136)

type consisting of several hinged panels, then tape the cutouts to the door, locate the breaks, or hinge points, mark and saw apart on the lines. Then replace on the door panels. Then when the door is opened the display will roll up with the door without any interference. Other scenes such as the Wise men, can be treated in the same way.

Almost any high point on the house will be the place to mount the Astronaut Santa and his capsule. Frame the cutouts as indicated and use 3/8-in. white nylon rope or 1/4-in. plastic clothesline for the shroud lines. You'll need about 30 ft. of the rope. Start at the chute, lead the rope to the capsule and back to the 'chute and so on. Build the framework to support the display as indicated in the details and anchor in place with sandbags laid over the ridge as shown.

Frame the free-standing displays, such as the stacked reindeer and the "lazy" reindeer, with 1 x 2s. Join with corrugated fasteners. When setting up the displays use 1 x 2s painted to match for stakes. Then tack the display frames to the stakes. For those groups that are braced to the house wall, attach the frames to stakes and extend braces to the siding or to a carport post.

Before storing the displays between seasons wash off any accumulation of dirt and grime, wrap each one in heavy paper, taped in place to keep out dust, and store overhead in the garage where the displays can be laid flat.

Heredity Changes in Orbit

Changes in heredity of plants and animals that orbited Earth in Sputniks have been reported by Soviet scientists.

Dry onion seeds grew faster than normal.

Accelerated cellular division in sprouts of pea, corn and wheat seeds occurred.

Gene mutations of fruit flies were 10 times that of other groups.

Chromosome changes in marrow cells of mice appeared in about 10 percent of the cells examined, compared to 3 percent in normal groups.

All plants and animals sent into orbit were compared with control groups that were subjected to all the physical stresses of space except the flight itself.

Biochemical changes were evident in the blood, urine and nervous system of rats, dogs and mice following flight, but these variations disappeared after some time.

The scientists said men and dogs experienced no pathological changes.

Cave Man a Cultured Citizen

After years of being regarded as something of a social slob, the Neanderthal man is now getting warmer attention.

Recent discoveries show that this prehistoric cave dweller walked slouched over, not because he resembled an ape, but because he suffered from arthritis; that he had artistic instincts, using paints for pictures; that he made superior flint tools; that he cared for the old and feeble, even pre-chewing food for toothless cripples; that he respected the dead, building sepulchers for them and providing a store of food and tools; and that he worshiped a deity.

Eyes Need Exercise, Too

Trying to "save" your eyes by not using them is a great misconception, a University of Colorado ophthalmologist says.

Dr. Morris Kaplan claims that eyes are like other parts of the body; unless they get a certain amount of exercise, this lack of usage can do more harm than good.

Watching television and movies is good exercise, he says. Glasses, while they have no curative power, can improve sight and eliminate headaches.

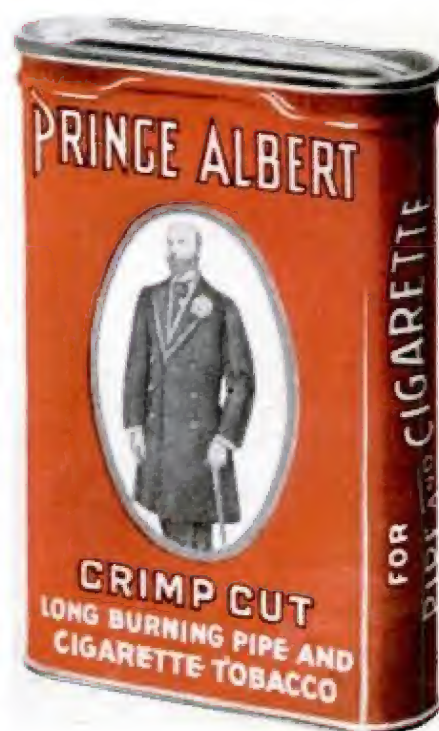
On the negative side, Dr. Kaplan says reading in the dark or while lying down can cause discomfort but does no harm.

The proof is in the puffing!



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- TASTES FRESH
- SMOKES COOL
- BURNS STEADY



The flavor most favored in the U.S.A.

PRINCE ALBERT

Build a Toboggan

(Continued from page 174)

hard woods can supply what is known as "ski stock", which is selected, straight-grained air-dried white ash 1 in. (also 1½ in.) thick and 4 in. wide. The pieces come 96 in. long. These you can easily resaw on your table saw to the required thicknesses. Allow a little for finishing the sawed faces with a belt sander or a sharp hand plane.

Preparing For Bending

After the slats and runners have been sawed, sanded smooth and tapered at one end, fill the wash boiler about three-fourths full of clean water. Place the tapered end of one slat or runner in the boiler and weight it. Bring the water to a rolling boil and in the meantime heat an equivalent amount of water in other containers. It takes 1½ to 2 hours of boiling to soften the wood and you'll need to replenish the original supply in the boiler, once, and perhaps twice. Keep close watch on the process for if the container boils dry, the wood will be ruined for the purpose. Keep the boiler filled to about the original level, adding only the boiling water from the supply container to maintain the temperature.

Bending

After about 1½ hours make a bending test of the tapered end of the runner. If it yields fairly easily when bent over the edge of the bench top, it probably is safe to bend over the caul. To do this you place the tapered end of the runner against the offset in the caul, Fig. 1, and clamp in place with a C-clamp, using a block of wood under the clamp pad. At this point make sure you have the runner in line with the caul. Then bend a few degrees farther around the caul and place another C-clamp. Proceed in this fashion clamp by clamp until the bend is complete. The clamps should be spaced as shown in the center photo on page 173. Keep the runner clamped in place for 24 hours before releasing it. Even then there'll be some springback, so you tourniquet the bent ends by wrapping three or four turns of fairly heavy twine around the bend and twisting tight with a length of dowel. Bent ends tourniqueted in this fashion are also pictured in the center photo on page 173. And that's it, for one runner or slat.

Duplicate Bending

You can only work one slat or one runner at a time with the one bending caul, or jig. By doubling the thickness of the jig you could work two runners or two slats, given clamps large enough to reach. Or—and here's an idea for someone who wishes to

make more than one toboggan, possibly for sale—if you have seven cauls (four for slats and three for runners), and a sufficient number of clamps, you can bend a complete toboggan in one operation. Using this equipment tied in with the clamping units pictured in the center and lower photos on page 174 you're in business. The latter will hold slats and runners securely in place and make quick, easy work of the assembly. But without this equipment you can make two bar, or cross, clamps using four pieces of 2 x 2 hardwood. One piece of each pair has one face planed slightly convex so that when you clamp each pair in place the convex face will exert pressure equally throughout the length.

Assembly

Assemble as in Fig. 2, beginning with the front rope-retaining bar. Drill screw holes through the slats and runners from the underside (with the curved ends overhanging the end of the bench as in the center photo, page 174) and countersink the holes so that the screw heads are just slightly below flush with the surface. Spread a line of resorcinol (water-proof) glue on the joining face of the retainer bar and screw in place, using flat-head brass screws as indicated. Proceed in the same way with all the bars, using your improvised clamps to hold the slats tightly together and in line while locating and screwing each bar in place. The bars are spaced 12 in. apart on centers as indicated, with one screw being used for attaching each slot.

Rope And Stirrups

With the assembly at this stage, all that remains to be done is to make the roll-edge binder strip, install the grab rope and stirrups, and finish the wood. The edge binder is a strip shaped as in the sectional view, and grooved $\frac{3}{16}$ x $\frac{1}{4}$ in. This is forced over the curved ends of the runners as in Fig. 2. Use glue in the joint. Drill holes for the grab rope in the curved ends of the outside runners and adjacent slats as indicated. Attach rope stirrups to the ends of each crossbar as in Fig. 3. Then tie a knot in one end of the rope—you'll need about 15 ft. of polyethylene rope—and pass it through the stirrups and holes in the curved end as indicated. Pull tight and tie a knot in the finish end.

Finishing

If desired, the three runners can be stained as indicated and the slats finished in natural color. Or you can finish both slats and runners in natural color by first applying a sealer and following with two coats of spar varnish. ★ ★ ★

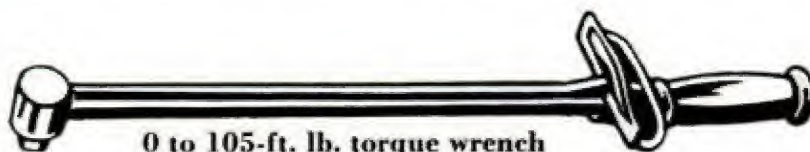
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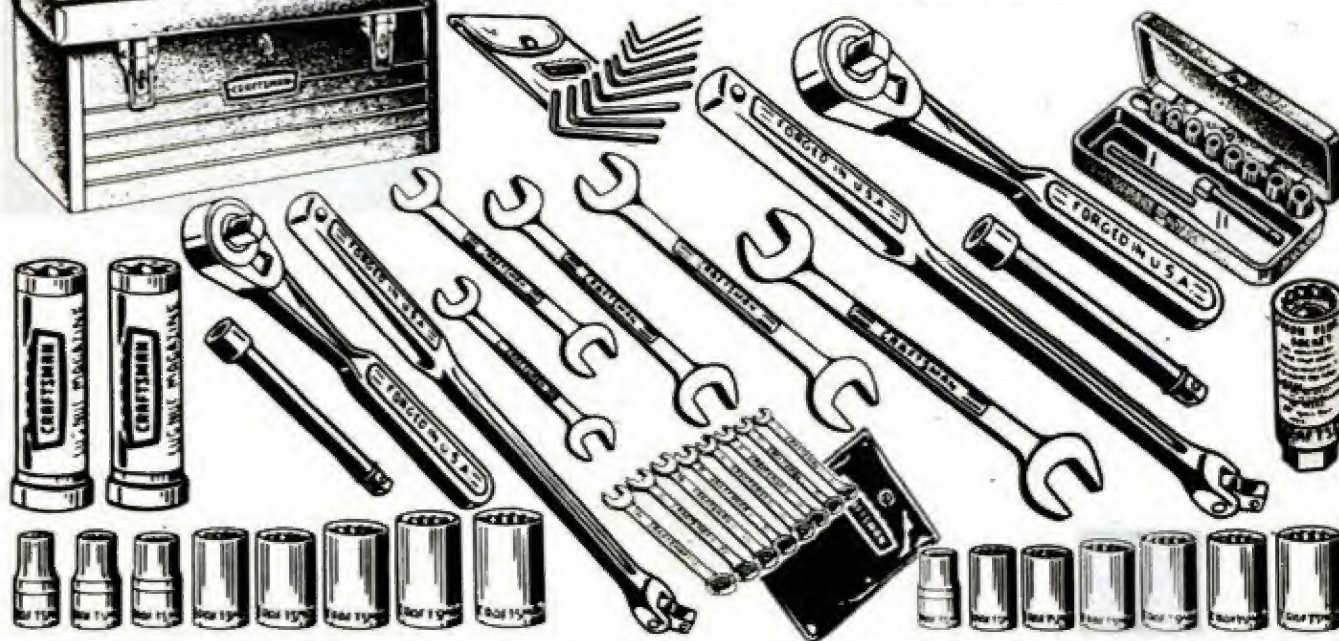
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39⁹⁹

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Regular separate prices total \$28.39! $\frac{1}{2}$ -in. drive parts. $19\frac{1}{2} \times 6 \times 3\frac{1}{2}$ in. tool box.

19⁹⁹

Save \$16.63! Craftsman 47-pc. Socket Set

Regular separate prices total \$46.62. $\frac{1}{2}$ and $\frac{1}{4}$ -in. drives. Also, 6-pc. propane torch kit.

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Regular separate prices total \$81.75. $\frac{1}{2}$, $\frac{3}{8}$, $\frac{1}{4}$ -in. drive parts plus many extra tools.

49⁹⁹

UNSURPASSED QUALITY

Made of molybdenum steel, heat treated, hardened to increase strength and wear-resistance. Chrome-plated over nickel.

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Hold That Tiger!

Is the Tasmanian tiger extinct? Naturalists and at least one famous explorer would like to find out for sure if any members of this prehistoric species are still alive. Last seen and positively identified 16 years ago, at least a few of these rare animals have been reported still roaming the remote fastnesses of the Australian island state of Tasmania.

If so, they've succeeded in eluding capture. Two sightings of the animal were reported in 1957 by helicopter crews over the southwest part of the island, but the reports were never confirmed.

The most publicized expedition to find the beast was carried out by Sir Edmund Hillary, conqueror of Mt. Everest. As in his attempt to find the fabled Abominable Snowman of the Himalayas a few years later, Sir Edmund returned from his tiger hunt empty-handed.

Thylacinus cynocephalus (thylacine, for short), is, or was, the largest of the Australian carnivorous marsupials. It dates back millions of years, virtually unchanged, as fossil remains show.

The thylacine has a wolflike head, tiger-like stripes across its rump, and a rigid tail somewhat like a kangaroo's. Like the kangaroo, it has permanently bent hind legs, causing it to hop on the tips of its five-clawed paws, instead of running like a Bengal tiger.

Being a marsupial, the animal carries its young—up to four in number—in a pouch. But here again, thylacine is different; its young face rearward in the pouch, a safety principle only now being rediscovered by modern plane designers.

Even if specimens are captured, the night-prowling beast won't ever be a zoo attraction. It is fully protected by the Tasmanian Wildlife Service and may not be molested. But naturalists would like to take one alive for a few days in order to obtain close-up photographs.

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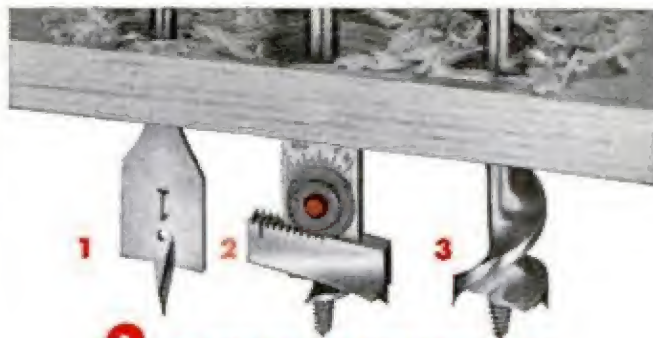
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2. Irwin No. 22 Micro-Dial expansive bit. Fits all hand braces. Just dial your size. Bores 35 standard holes, 7/8" to 3". Only \$4.00. No. 21 small size bores 19 standard holes, 5/8" to 1 1/4". Only \$3.60.

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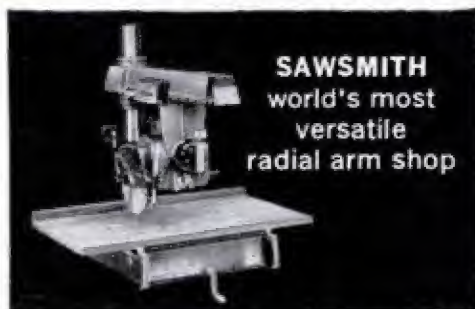


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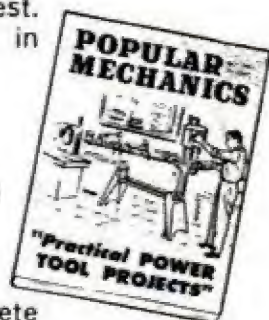


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AMERICAN CORPORATION

Interstate 75—Evendale, Cincinnati 15, Ohio

Crazy Glass

(Continued from page 75)

disk contains billions of submicroscopic holes that have an average diameter of one-sixth of one-millionth of an inch. One pore would have to be enlarged 12,000 times to admit a human hair.

Subjected to intense heat treatment, this microporous glass shrinks about two-thirds and forms a solid glass that has an exceptional combination of strength, optical clarity and heat resistance. Called Vycor brand glass, it provided the window in Col. John H. Glenn's Mercury capsule.

Gamma Ray Barrier

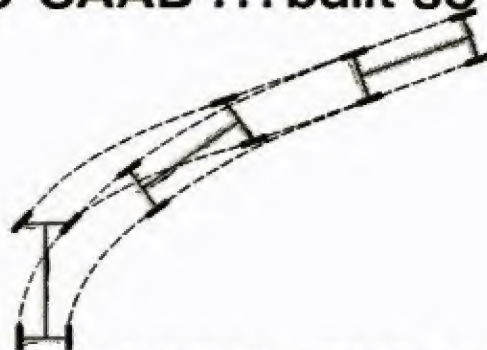
There is a glass for almost every use. For the new glass-walled skyscrapers there is a glass that admits the sunlight, but stops the heat. There is glass that will pass or absorb rays of the light spectrum or of nuclear energy—the heat of infrared, the glare of ultraviolet, the peril of deadly gamma rays. For the atomic scientist observing "hot cell" nuclear reactions, there is a glass with a high lead content that is eight feet thick and is still optically clear.

A new field of fiber optics utilizes long glass fibers to bend light, enabling a viewer to see around corners. The Air Force is experimenting with a glass-fiber optical surveillance system that would allow the pilot of the Dyna-Soar tactical glider to detect leaks, smoke and other hazards in remote parts of the glider and its Titan booster.

Space scientists are experimenting with a glass device called a "laser" (light amplification by stimulated emission of radiation). By piping rays and amplifying them hundreds of millions of times, this remarkable device may some day control the course of satellites and provide communication with men on the moon. Preliminary experiments indicate great possibilities for the laser in surgery because of its ability to focus intense heat from light in a tiny spot. A light beam produced from a laser can be focused through a hole 30 millionths of an inch in diameter.

There seems to be an unlimited future for glass. According to scientists, it is just a matter of time before everyone will be living in glass houses. The walls will automatically adjust themselves to changing intensities of light, and can be made opaque by the flick of a switch. They will be lighted and heated by electroluminescence and electroconduction, and will be air-conditioned by the rays of the sun focused on thermoelectric converters. That, at least, is the word from the glass experts. ★ ★ ★

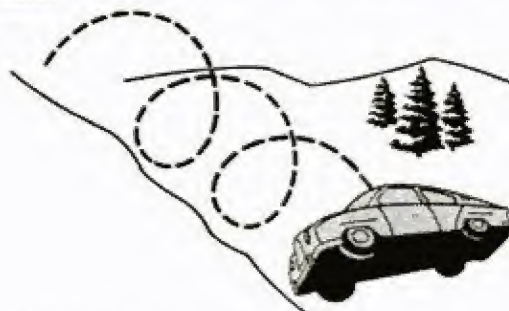
1963 SAAB ... built so well



SAAB FRONT WHEEL DRIVE, carefully calculated understeering, low center of gravity, and advanced suspension design work together to optimize roadholding ability and safety in motion. Self-centering action of directly driven front wheels (see diagram) provides best possible roadholding ability at high speeds. Positive traction of front wheel drive at lower speeds makes cornering easier, dangerous skids virtually impossible. Front wheel drive pulls SAAB safely—on any road, at any speed, through ice, snow, and mud.

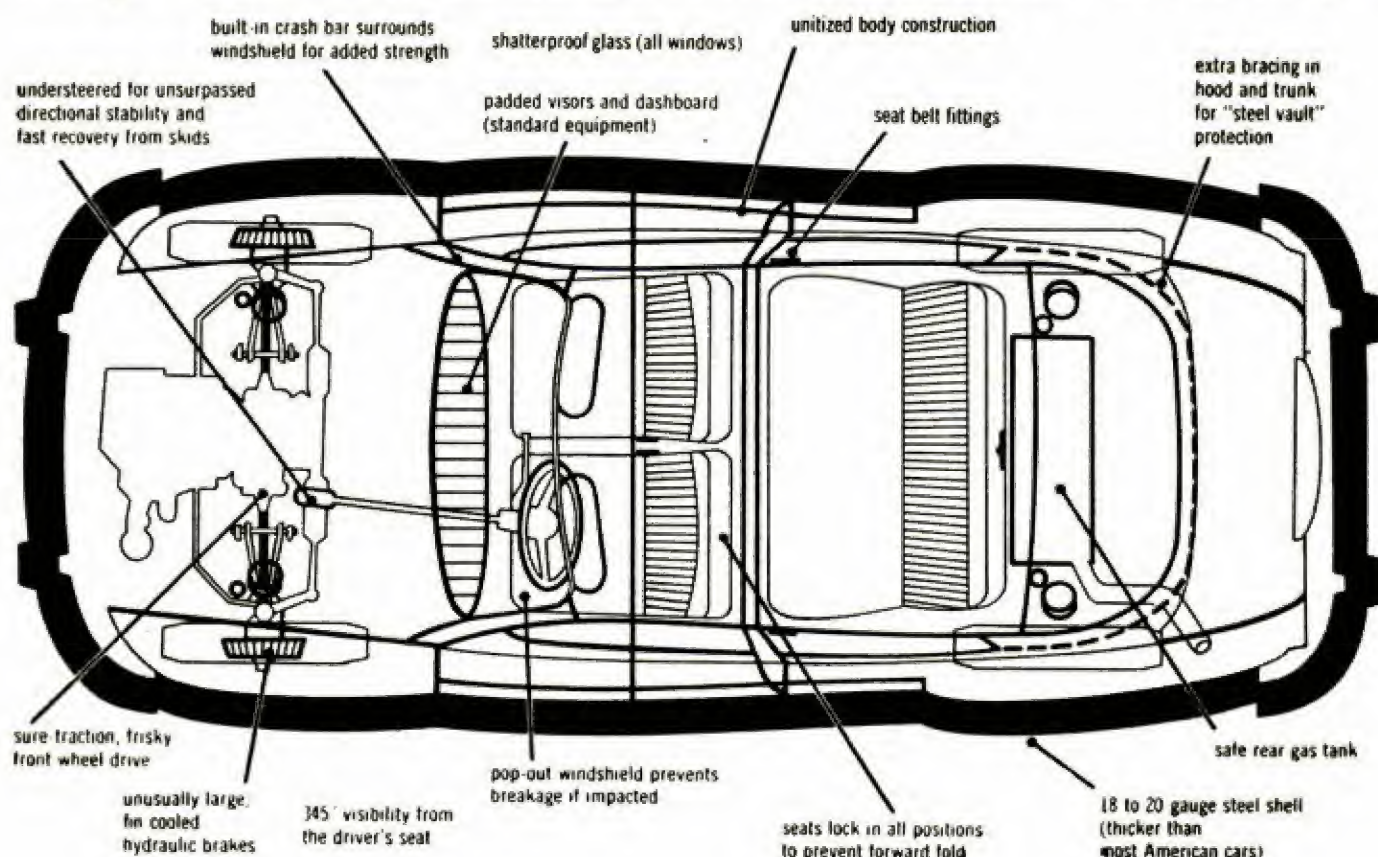


SAAB BODY SHELL is engineered to encase driver and passengers in a practically uncrushable steel airfoil on wheels. SAAB is unitized for rigidity. 18- to 20-gauge steel (heavier than most American cars) is used throughout. Additional steel members, $\frac{1}{8}$ inch thick, brace trunk and engine compartments. A crash bar, usually a racing car exclusive, surrounds the windshield for tremendous extra strength—where you need it most. Result: SAAB is as safe or safer than most large cars.



SAAB HAS BEEN SAFETY TESTED the hard way. It was rolled down Scandinavian ski slopes. Its basic over-all reliability has been proved in laboratory tests which simulate the roughest driving imaginable. Purpose: to make SAAB one of the safest cars you can drive. On the basis of test results, for example, SAAB provides as standard equipment such safety extras as: collapsible steering wheel, safety-padded dashboard and visors, positive locking seats, shatterproof glass in every window, and safety belt attachments.

that it has a 24,000-mile/24-month written warranty*



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for those who enjoy mechanical excellence, technical uniqueness, and extraordinary craftsmanship.

A critical look at *all* the facts and specifications will prove that SAAB is unquestionably one of the world's best engineered cars.

*Engine, transmission (3- or 4-speed gear box available), and differential have a written warranty for 2 years or 24,000 miles.



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DECEMBER 1962

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UHF-TV

(Continued from page 82)

and the hills of Pennsylvania, have both solved the problems of telecasting on these upper frequencies under diverse conditions.

Stations in the flat South Bend-Elkhart and Fort Wayne areas installed higher transmitting towers, and bunched them together on antenna farms so the home viewers had to point their receiving antennas in only one direction to get all available UHF channels. When the towers had been separated, viewers had to rotate their antennas and point them at each transmitter to get best possible reception from each.

Stations in the hills and valleys of Scranton and Wilkes-Barre combined extra-powerful transmitters and hilltop antennas to push signals into almost every nook and cranny of that up-and-down region. And those few nooks and crannies that got bypassed were filled in by community cable systems that set their receiving antennas on the nearest hill and fed the signals to the viewers.

In each area, after more than six years of experience, the transmitters are stronger, the signals are better, the reception is more efficient, the sets are improved, and the

servicemen are now more familiar with UHF and all its problems and solutions. Most of all, the viewers themselves have expressed almost total satisfaction with what they have been receiving.

Here's more on these cable systems.

They consist of large and privately owned receiving antennas, some set on mountain tops, that invariably get better reception than the average individual home antenna. Individual viewers then subscribe to the service, pay a monthly fee, and get their reception, via cable, from this one, mammoth master antenna.

One advantage, of course, is better reception, especially in fringe or difficult receiving areas, such as communities in hilly country. Another advantage is that the community system often gets special programs not shown over regular station and network television. Subscribers in Ithaca, N. Y., for instance, sat at home recently and watched the Patterson-Liston heavyweight-championship fight, a fight shown elsewhere by theater television.

Analyzing an Egg-Laying

You might wonder, if UHF has so much promise, why didn't it grow naturally?

Apparently it needs artificial irrigation. The Federal Communications Commis-



Even on the coldest mornings

Regardless of the weather, you get fast starts with AC Fire-Ring Spark Plugs. AC's potent spark provides the punch to get maximum power from every drop of gasoline. What's more, the searing heat at the exclusive AC tapered insulator tip burns away harmful carbon deposits before they have a chance to form — the insulator

sion, which controls the airways on behalf of the people, authorized the original 12 VHF channels in 1945. Even then, experts in and out of government predicted that these would not be enough. So in 1952 it authorized another 70 UHF channels.

The offer laid an egg. More than 1400 UHF stations were licensed by the FCC, but over the years these shrank to about 100 stations. VHF, meanwhile, grew.

The big bugaboo was that up to 1952 all television sets were made for VHF reception only. When UHF was created, most areas were saturated with VHF stations and UHF just didn't sell.

The viewers didn't buy the more expensive all-channel (VHF and UHF) sets because there weren't enough programs to watch, and there weren't enough programs to watch because there weren't enough viewers to watch them. And the advertisers weren't going to sponsor programs that nobody was going to watch. So, except for isolated areas, UHF died a natural death.

This is where the FCC stepped in. Technically, the new law forbids the interstate shipment of television sets that are unable to receive all channels—both VHF and UHF. But this is just a cute way of forcing

TV set manufacturers to start making all-channel sets exclusively—it would be foolish for each manufacturer to set up 50 factories in 50 states to make VHF-only sets just so they wouldn't have to ship them over state lines.

So, once the VHF-UHF sets are on the market, broadcasting on UHF might finally become more attractive, both to broadcasters and advertisers. And once the broadcasters and advertisers start putting on programs, owning a VHF-UHF set might become more attractive to the viewer.

Has the federal government the right to force UHF on broadcasters and public?

Whether it has or not, at this point it's irrelevant. The law exists and the electronics industry, while it may issue pious protests about government regulation, might also be secretly happy because it opens up a market for new antennas.

Also, potential broadcasters who were unable to get licenses for the saturated VHF channels, have 70 new channels to choose from. And more competition from UHF stations may well lift what has been called the "vast wastelands" level of television programming.

(Continued on page 202)



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actually cleans itself. Then there's AC's exclusive precision-ground knurled center electrode. Its sharp edges give you a crisper, more evenly distributed spark for more power and increased economy. The next time you install a new set of spark plugs insist on ACs. The Hot Tip is just the ticket for fast starts on those cold days.



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QUALITY POWER TOOLS SINCE 1934

UHF-TV

(Continued from page 201)

So, even if a legal protest is tried in the courts, it might be some time before any decision is made, and by that time UHF should be pretty well established.

Right now, the future of UHF looks good.

The controversy over government intervention might die a natural death, and the controversy over the advantages and disadvantages of VHF and UHF might be resolved, in time, by the happy marriage of both—or by the emerging dominance of UHF. Advocates in and out of the FCC would like to see this day.



VHF, UHF KNOBS usually differ. VHF knob jumps from notch to notch. UHF knob is dialed smoothly

The beautiful picture possible on UHF is probably its greatest attraction, and some predict that color television will come into its own on the higher frequencies.

Others see a real breakthrough in programming, with greater potential for educational television, live telecasts of many more sports events, municipal events (city council meetings, police and fire work), even live Broadway shows and first-run movies, plus foreign-language programs for minority groups.

There are certainly plenty of channels available for this now. With all these new channels, is there a chance that new national networks will grow to challenge the three big networks?

The boys over at ABC, CBS and NBC lie awake nights thinking about this. ★ ★ ★



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Recent tests showed that dogs can detect human odors outdoors as long as two weeks after the person has left the scene. Indoors, they can detect them up to six weeks.

In the tests human fingerprints were made on glass slides and stored both indoors and outdoors, along with slides which no human had touched. In every case the dogs could spot the difference.

They were weaker in detecting such pungent odors as clove and anise which man detects easily.

Transmit Light Beyond Horizon

Light and infrared signals can be transmitted and received at distances up to 200 miles even when the transmitter and receiver are at sea level, according to studies made by the Naval Research Laboratory.

The light and infrared signals are indirectly transmitted and received because they are scattered by tiny, aerosol-like particles in the earth's low atmosphere. Infrared is superior to visible light because it is not scattered as much.

A high-intensity xenon flash tube was used as a projector and an infrared sensitive photoelectric cell as the receiver.

Air Source for Spacemen

One idea for supplying exploring spacemen with oxygen has resulted in a mouse going 80 hours, at a simulated altitude of 75,000 feet, without breathing any oxygen other than that made when the carbon dioxide and water vapor of its breath reacted with a handful of potassium superoxide to release oxygen.

In the experiment at the Lockheed Missiles and Space Co., Sunnyvale, Calif., the one-ounce mouse was kept in a bell jar. It apparently suffered no ill effects. The mouse required an ounce of potassium superoxide for each 20 hours in the cell. A 150-pound astronaut, thus, would use 47 pounds of material in the same time.

• A diamond, nature's hardest known substance, could be even harder. Since the atoms in the carbon molecule of a diamond are loosely arranged, less than half the available space is used.

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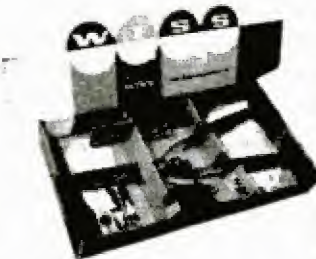
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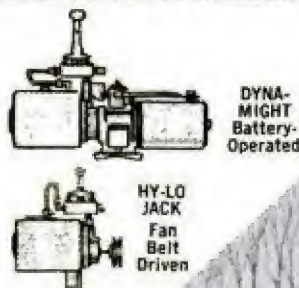
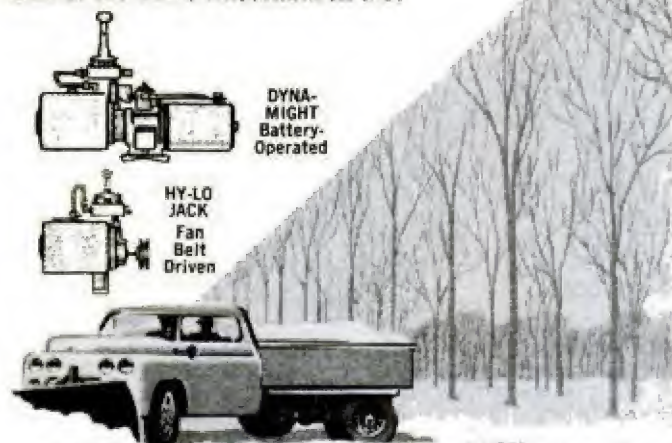
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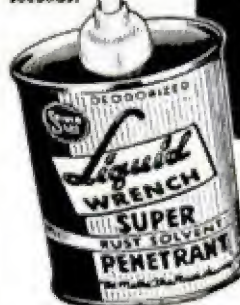


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Car Radiator — "DURO-PLASTIC Aluminum sealed my radiator after a fan belt went through it . . . saved a \$15-\$20 charge at a shop." —Pennsylvania motorist.

Fragile things — ". . . repaired antique vase with DURO-PLASTIC. It enabled me to outline skillfully, seal securely, enhance the beauty of the design." —El Paso aesthete.

Trailers — ". . . waterproofed the seams of our house trailer . . . very easy to apply . . . not a leak since." —Seattle trailer owner.

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Gutters and Downspouts — "It quickly repairs gutters and downspouts, and solders gutter joints." —California apartment manager.

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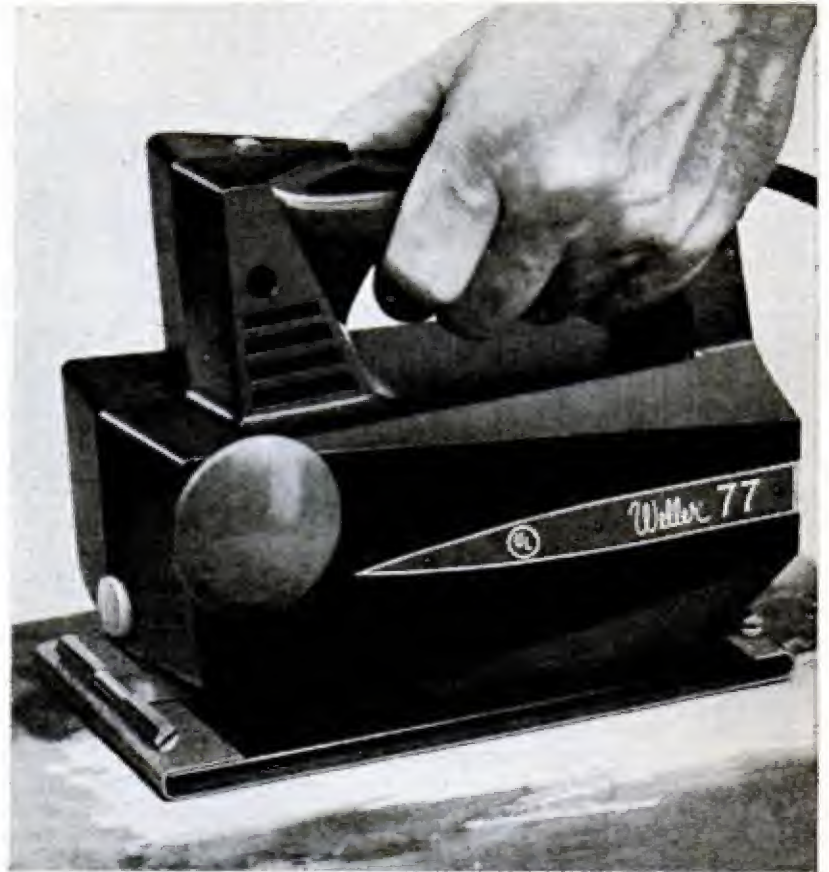
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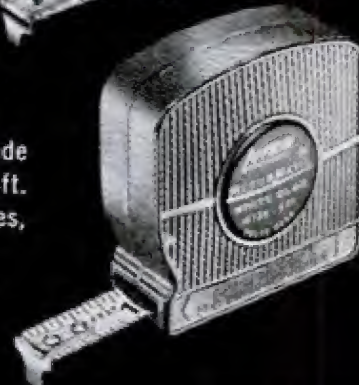
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Portable Light in a Tube

Encased in a tough plastic tube, a new fluorescent inspection lamp lights hard-to-get-at places. Priced at \$18.50, the lamp is made in Denmark and sold in the U.S. by Technico, 122 Van Brunt St., Brooklyn 31, N. Y. It has a 24-foot cord.

Meteoroid Hazard on Moon Trip

Spaceships traveling to the moon will run the risk of being punctured by meteoroids and perhaps seriously damaged. Estimates on the probability of being hit range from once in every 11 days to once in every 57,000 days. The trip to the moon will take 14 days.

The probability of being hit depends on meteoroid distribution, velocities, and spacecraft structures, report Drs. C. Robert Nysmith and James L. Summers, Ames Research Center, Moffett Field, Calif. Scientists believe that effective shielding can be designed to lessen the meteoroid hazard.

Noisemaker Maps Ocean Floor

A noisemaker to study the ocean's floor has been developed by Dr. Harold E. Edgerton at the Massachusetts Institute of Technology. Called the "boomer," the instrument will take the place of explosive charges for mapping and seismic studies of sediment layers on the ocean floor.

The "boomer" consists of a flat coil between two aluminum plates. When a current is sent into a coil, the plates fly apart producing a small explosion. Reflections of the sound are picked up with seismic apparatus towed behind a ship and used to record the ocean bottom's profile.

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• The longest, driest coastal desert in the world stretches along the Pacific shore of Peru and northern Chile. Several weather stations in the area have recorded no rainfall for 20 years. However, brief torrential rains sometimes fall in spots and melt clusters of baked-mud houses.

• The behavior of some animals may be contrary to their reputations. In battle, a wolf will not kill another wolf that offers its throat in a gesture of submission; but a dove, the symbol of peace, will ruthlessly peck a helpless opponent to death.

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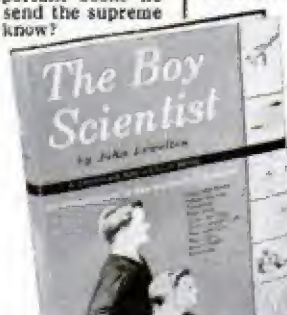
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Map Antarctica's Mountains

A two-pronged expedition is now heading deep into the Antarctic to take a closer look at some of the icy continent's virtually unknown mountains during the brief southern summer months.

One seven-man team under geologist Dr. Arthur B. Ford of the U.S. Geological Survey will study the rock layers—heretofore seen only from the air—in the Patuxent Range of the Pensacola Mountains. The geologist will map mineral deposits, and look for meteorites and fossils. An expedition led by Dr. Ford last year discovered a fresh meteorite several hundred miles east of the Pensacolas. Fossil remains, if found, could date the formation of the mountain chain.

A second four-man party is preparing to map the mountains from Hallet Station west and from the Beardmore Glacier east to the Thiel Mountains. The team will travel nearly 2000 miles of unmapped country by helicopter and motor toboggan. They'll use a special radio mapping technique, in which radio signals will be bounced off 12,000-foot mountain peaks to record the exact heights of the rugged coastal mountains. The process will also give accurate distances between peaks for precise horizontal mapping of this virgin territory.

The geological and mapping expeditions are part of the fourth year of the Operation Deep Freeze studies of the Antarctic. Other scientific teams will continue explorations of the continent's glacier and ice formations, its upper atmosphere physics, and its biology, chemistry and weather.

Warm Blooded Bodies Vibrate

Tiny vibrations, detected in the bodies of mammals, may be the secret of regulated body temperature. Experiments indicate that the microvibrations, resulting from permanent, alternating muscle contractions, remain constant from birth to death.

Man's body vibrates with 7 to 13 impulses per second, even during sleep. The amplitude is increased by psychological shock, stress, and physical exertion and decreased by sedatives. Guinea pigs show impulses continue 50 to 70 minutes after the heart has stopped.

Because the vibrations are constant in warm-blooded animals and absent in cold-blooded animals, it is likely that they are the mechanism which allows mammals to maintain a precise body temperature despite outside temperatures, reports Dr. H. Rohrer, Institute of Psychology, University of Vienna.

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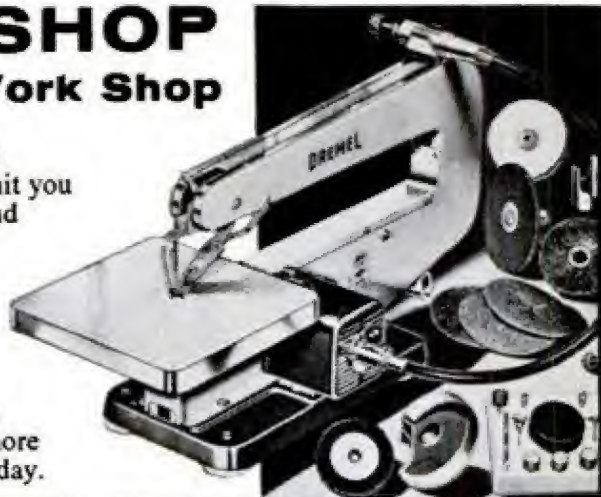
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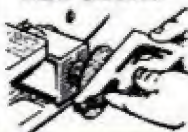
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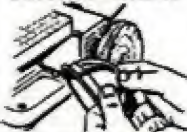
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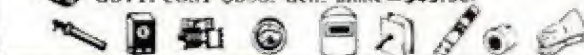
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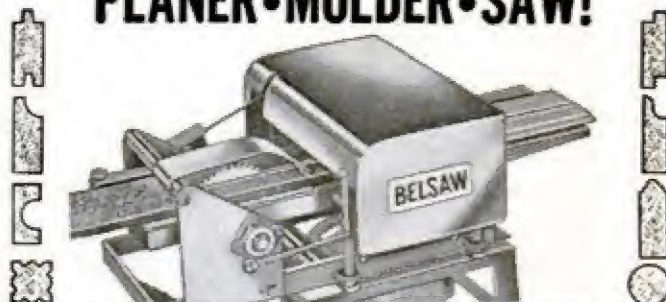
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• Item #675. New Gov't. unit. Generates 115-v (800 cycle) AC (1200-130 and 30-v up to 200 amps DC).
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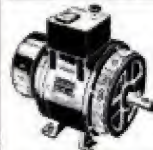
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• ITEM #453. Expensive Gov't. Compressor. G.E. motor, 115-v, 60-c. Built-in air filter, relief valve, etc. Very compact and efficient.
• For paint spraying, insecticides, air brush, etc. A "Super Buy." Wt. 55 lbs. Gov't. cost over \$250. SALE \$19.97
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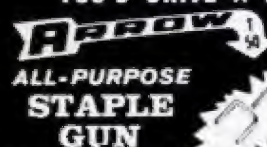
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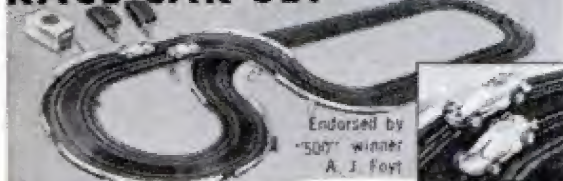
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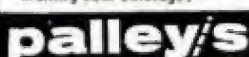
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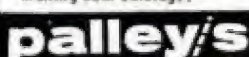
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Rocket May Capture Asteroid

Capturing an asteroid by landing a rocket on it for the purpose of studying the origin of the solar system may be possible, according to Dr. Su-Shu Huang of the National Aeronautics and Space Administration's Goddard Space Flight Center.

The last stage of a multistaged rocket would be landed on the asteroid, slowing it sufficiently to bring it into an orbit around the Earth.

Once in orbit, the rocket would continue firing to speed up the asteroid's velocity as much as necessary to make it an Earth satellite.

Russians Plan Huge Telescope

Russian scientists are planning to build the world's largest telescope. It will be set up on one of the Northern Caucasus summits surrounded by other equipment in a proposed institute of theoretical astronomy, according to Dr. L. Artsimovich, USSR Academy of Science.

The purpose of the institute is for research and development of new equipment for satellites and spaceships.



Quick Sharpener for Skates

A pocket-sized ice-skate sharpener developed by Canadian General Electric Co. can be adjusted to put a perfect edge on both hockey and figure skates with just six strokes across the blade. The egg-shaped tool uses a cemented carbide disk to cut into the steel. It sells for \$3.50.

Second Childhood Joke Valid

Man's growth rate increases again after he passes 70, thus providing some "slight justification" for the second childhood joke.

The rate of shrinkage is greatest between 60 and 70 years of age, Dr. A. E. Needham of Oxford University reported. The shrinkage is slower in the very old while the specific growth rate increases again in old age.

"There is direct evidence of this," Dr. Needham said, "in the rate of cell division in some tissues. Other properties also reverse their trend in later life."

Here's Why the Worm Turns!

Earthworms seem to have the talent for determining the direction of the earth's magnetic field, as it changes with moon and season.

According to Dr. Frank A. Brown, professor of biology at Northwestern University, if it's winter and the moon is full or waning, a southbound worm will turn right to get around an obstacle. During the new moon, he'll turn left to get around the same obstacle. In spring, the reverse is true. The microscopic paramecia and snails react the same way; the turn seems to depend on the direction of the earth's magnetic field.

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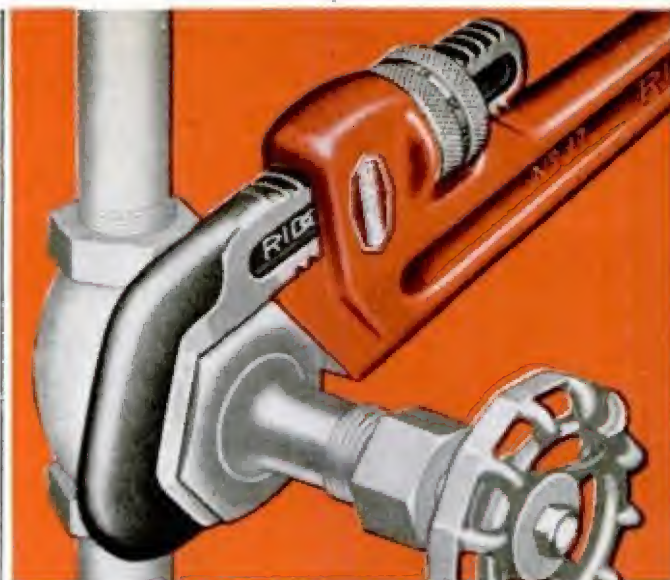
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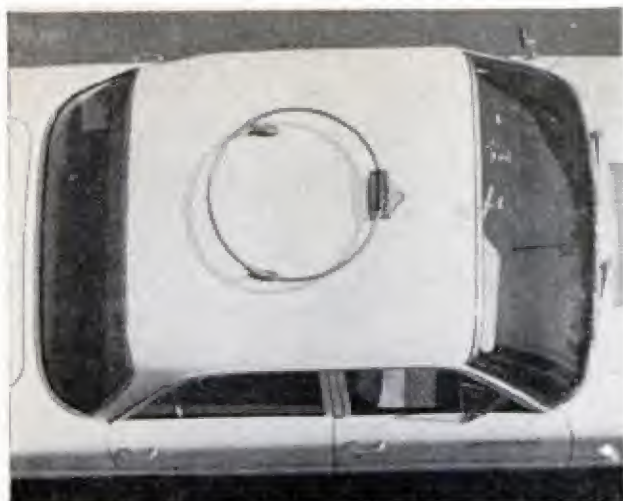


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Circular Antennas

A hoop-shaped cartop antenna that may replace the familiar whip antenna has been successfully tested for two-way radio communications. Known as DDDR (for Directional Discontinuity Ring Radiator), circular shaped units could also take the place of high-tower ground antennas.

On cars, the low-profile ring is said to be equal to or superior to whip antennas; it radiates equally all around the horizon, and does not change its pattern at high speed, as a whip antenna does in a high wind. It can be switched instantly to any adjacent frequency. A 27 mc.-unit would be 27 inches in diameter, mounted two or three inches above the car roof. One end of the ring is grounded directly to the vehicle for protection from lightning or contact with high-voltage power lines.

For ground installations, a circular unit 20 feet in diameter (below) and only two feet high would be equal to a tower antenna 60 feet high. The developers of DDDR, the Ventura Division of the Northrup Corp., are now designing huge ring antennas a mile in diameter and more than 100 feet high. These, according to Northrup, would be much more efficient than the best long-wave antennas now in use.



DECEMBER 1962

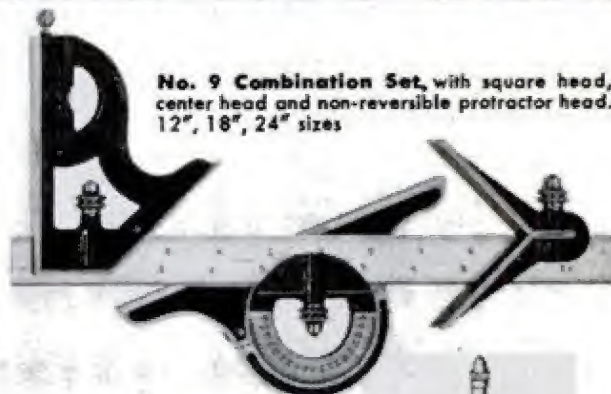
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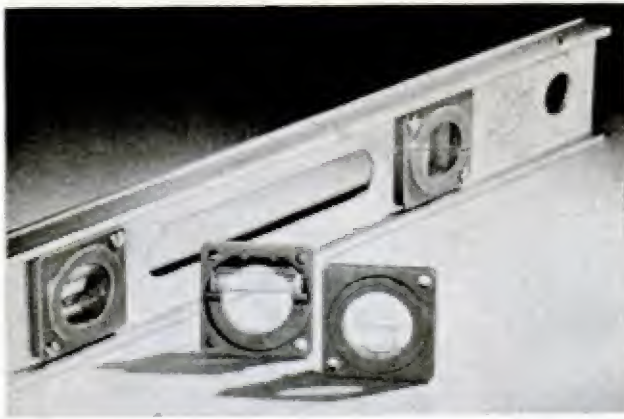
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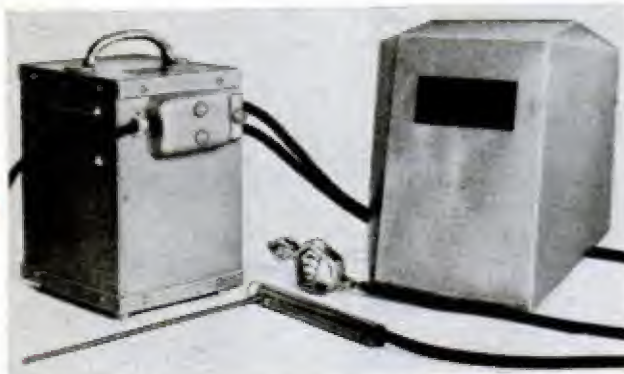
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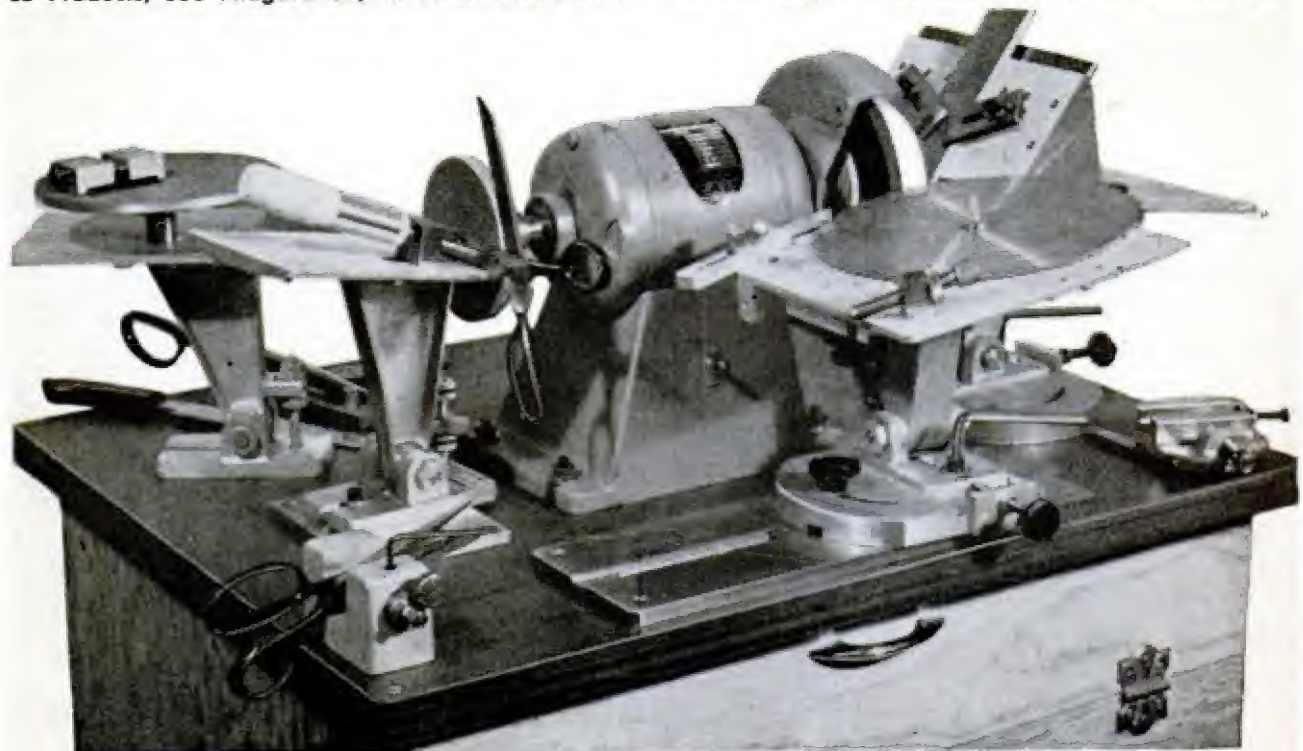


ALUMINUM LEVEL has replaceable glass bubble vials mounted in pronged, plastic holders that snap firmly in position on the frame. Assembly is dust and moisture proof. Johnson Products Co., Milwaukee, Wis.



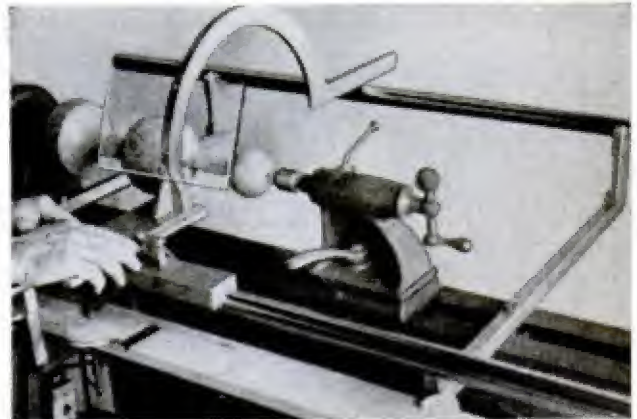
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- ☐ Automation
- ☐ Basic Electronics
- ☐ Electronic Computers
- ☐ Electronics Technician
- ☐ Hi-Fi Stereo and Sound Systems
- ☐ Industrial Electronics
- ☐ Ultrasonics

ENGINEERING (Professional)

- ☐ Chemical
- ☐ Civil
- ☐ Electrical
- ☐ Mechanical

ENGLISH and WRITING

- ☐ Better Business Writing
- ☐ Introductory Technical Writing
- ☐ Short Story Writing

Practical English

HIGH SCHOOL (Diploma)

- ☐ High School General
- ☐ High School Math
- ☐ High School Secretarial
- ☐ High School Vocational
- ☐ College Preparatory

MECHANICAL and SHOP

- ☐ Gas and Electric Welding
- ☐ Industrial Engineering
- ☐ Industrial Instrumentation
- ☐ Machine Design
- ☐ Machine Shop Practice
- ☐ Mechanical Engineering
- ☐ Reading Shop Blueprints
- ☐ Tool Design
- ☐ Toolmaking
- ☐ Safety Engineering

SECRETARIAL

- ☐ Clerk-Typist
- ☐ Professional Secretary

- ☐ Shorthand
- ☐ Stenographic
- ☐ Typist

STEAM and DIESEL POWER

- ☐ Boiler Inspector
- ☐ Power Plant Engineering
- ☐ Stationary Diesel Engineering
- ☐ Steam Engineering

SUPERVISION

- ☐ Foremanship—Supv'n
- ☐ Personnel—Lab. Rel'n's

TV-RADIO

- ☐ Radio and TV Servicing
- ☐ Radio-Telephone License
- ☐ TV Technician
- ☐ Practical Radio-TV Engineering

MISCELLANEOUS

- ☐ Railroad Textile
- ☐ Other (please specify)

Name _____ Age _____ Sex _____
Home Address _____
City _____ Zone _____ State _____
Occupation _____
Employed by _____ Working Hours _____

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This is the story of an automobile only 2 inches long.



The car shown above is "the active ingredient" in a new hobby sweeping the country. Called "MODEL MOTORING", it involves scaled-down automobiles remote-controlled for competition on electrified roadways. The cars themselves, handsome replicas of real vehicles, are rear wheel-driven, just like their prototypes. A tiny miracle motor purrs under every hood.

Remember when every boy had to have a set of electric trains for Christmas? Nowadays it's MODEL MOTORING, and no wonder. Who would prefer a pokey loco going around in circles to the pulse-pounding action of a road race? Imagine then how exciting it can be when you're actually *in* the race, actually "driving" your own 2-inch car, zooming pell mell into the straightaways, spinning out dangerously on the turns, battling for the lead at scale speeds up to 250 mph? Can't you just see his eyes light up when he opens that MODEL MOTORING package on Christmas morning? ("What do you say, Dad? Want to race?") Designed in HO scale, MODEL

MOTORING is wonderfully compact, easy to assemble, and just as easy to take apart when Mom simply has to have the bridge table. Choose the set that best fits your budget—from \$21.98 for a lane-changing CRISS-CROSS layout, to \$49.98 for the deluxe 4-lane CLASSIC '50. All sets come equipped with vehicles, speed controls, transformer, curved and straight road sections. One word of caution: genuine MODEL MOTORING, made only by AURORA, will be in short supply as the holiday approaches. Reserve the set you want TODAY — at a hobby, toy, variety or department store nearby.



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**MODEL
MOTORING**

AURORA

MODEL
MOTORING
4-LANE RACING SET
CLASSIC '50

